

December 14, 1929

A McGraw-Hill Publication

20 Cents per Copy

# AVIATION

*The Oldest American Aeronautical Magazine*

THE FUTURE OF *Air Express*

By Col. Harry H. Blee

THE *National Sales* ORGANIZATION

AIRSHIP *Powerplant* PROBLEMS





## "--who arrived by air" new business contacts constantly await executives who travel by plane

Business executives who travel by private airplane are popular visitors—entertainers and entertainers naturally follow. As honored guests at luncheon clubs and at business dinners they find unexpected opportunities to make new and valuable friends.

Throughout the country, many companies now operate their own Ryan planes for business trips—provide their executives with the advantages of air transportation. For not only does traveling by airplane satisfy the



opportunities for officials to make new contacts but more important still it enlarges their field of activity.

With a cruising range of 700 miles and speed of 150 m.p.h. Ryan airplanes figuratively reduce the size of a state to that of a county. In time saved, alone, Ryans pay their own way. Today Ryan airplanes are contributing to the greater success and prestige of many business houses. Let us tell you more about what has been accomplished with Ryan transportation.

BUILDERS OF LINDBERGH'S



"SPIRIT OF ST. LOUIS"

RYAN AIRCRAFT CORPORATION  
DETROIT AIRCRAFT CORPORATION

ROBERTSON, MISSOURI  
UNION TRUST BUILDING, DETROIT

# CHASE AIRCRAFT TRAVEL FABRICS

THE demands of aircraft manufacturers and operators are exacting . . . this extends to upholstery and trimming, as well as to other features of construction and decoration. And this is why

CHASE  
*Velmo*  
MOHAIR VELVETS

are fulfilling these requirements for the ideal Aircraft Upholstery: (1) Velmo is a lightweight material; (2) it is as near inflexible as any textile; (3) it is colorful, comfortable, and artistic in design; and (4) it is easily and quickly cleaned.

And for Trim and Upholstery of  
Mechanics' and Pilots' Seats

CHASE  
*Leatherwove*  
MADE BY  
SANFORD MILLS, LANCHESTER, MASS.

—a scientifically treated fabric—meets the demand of the experts for a long wearing, beautifully-grained fabric, in a variety of colors, and eminently suitable for panels, book-pockets, door-trim, etc.

Write for samples

These Chase Aircraft Travel Fabrics  
Made by  
SANFORD MILLS

L. C. CHASE & COMPANY, Selling Agents, BOSTON  
NEW YORK DETROIT SAN FRANCISCO CHICAGO

## How Do You Train Your Welders?

AN important feature of Linde Process Service is aid in the selection and training of welders for specific tasks. This helps secure uniformity in both the appearance of the completed product and the strength and tightness of the welds. Linde Process Service can also help you lay out a system for training apprentices, thus assuring a dependable supply of experienced operators.

**LINDE OXYGEN**  
The Linde Air Products Co.

**Perco-O-Lite**  
**Dissolved Acetylene**  
The Perco-O-Lite Co., Inc.

The  
Best of  
Everything  
for  
Owelding  
and Cutting

**Apparatus and Supplies**  
Oswald Acetylene Co.  
**UNION CARBIDE**  
Union Carbide Sales Co.

Units of

**UNION CARBIDE AND CARBON CORPORATION**

General Offices

30 East 43rd St., New York, N. Y.



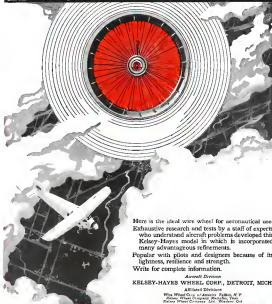
Sales Offices

In principal cities of the country

41 Lindy Place—15 Penn-O-Lite Plazas—111 Elyton Washington Blvd.—110 Jackson  
Blount Ave. Cincinnati—Apparatus Warehouse North—315 Carle Ave. Milwaukee

Now is the time to get Economy Pressure, the perfect cut-throat in your acetylene industry—Economy Pressure is guaranteed by National Carbon Company, Inc., and Union Carbide and Carbon Corporation.

## STRENGTH and LIGHTNESS



Here is the ideal wire wheel for aeronautical use. Exhaustive research and tests by a staff of experts who understood aircraft problems developed this Kelsey-Hayes model in which is incorporated many advantageous refinements. Popular with pilots and designers because of its lightness, resilience and strength. Write for complete information.

Aircraft Division  
**KELSEY-HAYES WHEEL CORP., DETROIT, MICH.**

Also Sales Division  
Wire Wheel Corp. of America, Buffalo, N. Y.  
Chicago, St. Louis, Cincinnati, Philadelphia, New York  
Kelsey-Hayes Company, Ltd., London, Eng.

# KELSEY-HAYES

## Meeting FAITH with FACTS

**E**LEVEN airplane manufacturers entered their orders for the new Continental Aircraft engine prior to passing the test for Approved Type Certificate before the Bureau of Standards of the United States Department of Commerce. The results of the test—now completed and the A.T.C. No. 52 granted—more than justified this expression of faith. The engine exceeded the Department of Commerce's requirements by running ten hours with an open throttle instead of the required five. It exceeded the twenty-five hours required by the Department before being tested by 175 hours, 100 of which were run at full throttle. It had 150 hours of flying test instead of the required ten. The Bureau rated the engine at 165 h.p. at 2000 r.p.m. We are now ready to make deliveries on production schedules.

"Approved Type Certificate No. 11 E. U. S. Department of Commerce"

CONTINENTAL AIRCRAFT ENGINE CO.  
AERONAUTICAL DIVISION  
Office and Factory Detroit, Mich., U. S. A.



A well-developed lubrication system also tends to promote engine engine reliability



## Continental Engines

## BLACK & DECKER Portable Electric Drills "With the Pistol Grip and Trigger Switch"

**FAST - ACCURATE  
EASY TO HANDLE  
STRONG and SERVICEABLE**

The latest in design and construction  
at unusually low prices.

*There is a Black & Decker Portable Electric Drill for every drilling operation --and hole saws and other accessories available to extend their usefulness.*

In addition to their complete line of drills Black & Decker manufacture other portable electric tools, such as—

Tappers, screw drivers, nut runners, hammers, saws, Sanders, electric glue pot, electric tool chest, a complete line of cable reapers - and hole saws and accessories to be used in connection with their tools.

Write for a complete catalog.

The Black & Decker Mfg. Co.

Toronto, Ontario, Canada

Towson, Md. U. S. A.

Black, Back, England

## THE COST OF A FORD PLANE IS UNUSUALLY LOW!



THE FORD MOTOR COMPANY has pioneered in the manufacture of highly efficient, safe, all-metal transport airplanes by multiple-unit, on-line production methods.

The remarkable, almost clock-like performances that Ford tri-motor transports are giving daily over thousands of miles of scheduled air flight is proof of the minute exactness taken in building and designing these planes. Their recognized economy of operation in carrying freight and passengers at a profit is an important factor from the operator's standpoint. Safe and efficient, powered with three motors, capable of flying and climbing on two, these transports have

the full confidence of air-minded America.

By creating new and modern methods of manufacture the Ford Motor Company is able even to increase the operating efficiency of the Ford tri-motor transport and at the same time after the operator an airplane of unsurpassed durability (as Ford planes have yet none out in service), with a high factor of safety, inherent stability and tremendous reserve power for an exceptionally low price, \$42,000 to \$55,000 (standard equipped of Dairbores).

Complete information from The Stout Metal Airplane Company, Division of Ford Motor Company, Dearborn, Michigan.

*A Ford plane is on exhibition in the Powerhouse Railroad Station in New York. A representative of the company is in charge of the plane and is prepared to answer all questions regarding its operation and cost.*

THE  
UNFAILING  
PERFORMANCE  
OF



*Scintilla* Magnetos  
... a protection  
to Axelson quality



Axelson knows but one standard in the building of magnets—its highest. The auxiliary equipment must be equally as high as standard. So Axelson engineers considered many tests in the selection of the magnetos—demanded certain performance accomplishments—studied magnet construction with the same thoroughness that was devoted to the designing of every other part of the engine.

Scintilla Magnetos, by reason of their fine ignition performance and consistency in the operation of Axelson Engines, were the unanimous choice of Axelson Engineers. Scintilla ignition is over-riding—it is keeping with Axelson quality.

**Axelson Aircraft Engine Co.**

Factory and General Office,  
Center Randolph St. and Boyle Ave.,  
Los Angeles, California  
IF 9-364-2275



**AXELSON AIRPLANE ENGINES**



## An ERA of GREATER PROFITS/



UNLIKE the bicycle dealer of a generation ago who had to be trained in the mysteries of ignition, brakes, and motors in order to handle motor cars, the automobile dealer is already equipped to enter this last and most profitable transportation era.

Aviation is the logical extension of the automobile dealer. His sales force is capable of presenting the plane to a motorwise public, and his mechanics are best fitted for service.

The same opportunity which was offered to the bicycle shop yesterday is offered to you today.

BRUNNER-WINKLE AIRCRAFT CORPORATION  
17 Haverkamp Street, Brooklyn, N. Y.



Automobile dealers with vision will appreciate the possibilities of greater profit, to be had in selling BIRDs.

Ever since the first BIRD took the air it has held the standard for safety. Its inherent construction, its very design, its inherent stability—every atom of its design and assembly assure its leadership in the popular personal class. It is ideal for touring, sport, or transport. Its price, performance, and safety factor make it the latest selling of all planes, and our franchise secures the greatest profit to the dealer selling them.

Write today for details of franchise in your territory.



## The engines ran so smoothly They called her the "Humming Bird"

Even after 425 hours of daily service between Chicago and Kansas City, Western Air Lines officials were reluctant to take this recent running Fokker F-10 out of service long enough to make the general inspection required by their operations procedure.

The three Pratt & Whitney Wags which had been lubricated exclusively with Mobiloil Aero II—with 40-hour draining periods—were disassembled. After inspection of these engines by

engineers of the Pratt & Whitney Aircraft Company, Mobiloil Aero II was approved for use in all Wags and Ilmorags.

Regular use of the new Mobiloil Aero Oils assures operating economy, lower oil consumption, lengthened draining periods, clean engines, and minimum overhaul and repair charges.

**VACUUM OIL COMPANY**

Makers of high quality lubricants for all types of machinery

the New   
**Mobiloil**  
**AERO II**

FOR ROCKER-ARM LUBRICATION USE MOBILGREASE

TRAVEL AIR...THE STANDARD OF AIRCRAFT COMPARISON



## PREFERENCE FOR TRAVEL AIR

again confirmed, by members of the Long Island Aviation Country Club, America's most exclusive air club

Sportmen the country over thrill at the Travel Air's brilliant performance, its remarkably quick take-off and unfailing ability to land at slow speeds... combined features that have brought Travel Air sales larger than any other plane sold in the United States. «The exclusive Long Island Aviation Country Club roster shows that out of nineteen various makes owned by members, over 22% are Travel Air—the remaining 78% being distributed among eighteen other manufacturers. «Here again the complete confidence of air-minded sportmen is expressed in outstanding preference for Travel Air. Illustrated Booklet, "The Story of Travel Air," mailed upon request.

**TRAVEL AIR**  
WICHITA, KANSAS

Division of  
CURTISS-WRIGHT CORPORATION  
Sales Office: 27 West 5th Street  
New York City



## Ride 'em, Cloudboy!

To THE veteran pilot a thick, blanket cushion cloud is just one of those things. Wet? Sticky? Cold? Snow? It is—but why worry...

The air-wise pilot dons a Spalding suit, and rides confidently into anything the elements have to offer. The going may be tough—but for warmth, for protection, a Spalding suit is tougher!

The one-piece, slip-on one pictured above serves to illustrate what we mean. An outer shell of water-proof Delford cloth sheds moisture like a raved-up pup. An inner layer of soft wool fleece baffles the coldest, most penetrating of wintry winds.

Not on your neck and chin forgotten. Just wrap-

gle your chin down into that electrified lamb for comfort, it's soft. It's cozy. It's warm.

Not bulky, this suit permits perfect freedom of movement. And five hookless fasteners allow you to get in or out of it in the fastest possible R. P. M. Beautifully made, sturdy—here's a suit to give you a long distance record for wear. Only \$65.

Spalding has, of course, a complete stock of flying equipment. It is carried by all Spalding stores, and at many of the leading fairs. Get the free catalog.

CLIP FOR FREE AVIATION CATALOG

A. G. SPALDING & BROS.  
180 Nassau Street, New York City  
Please send me Aviation Catalog

Name

Street

City  State

*A. G. Spalding & Bros.*  
AVIATION EQUIPMENT

© 1939, A. G. S. B.



## Another member of a famous family—

## Wasp Junior



a 300 H. P.  
ENGINE, BY  
PRATT & WHITNEY



Full Side View

To the individual owner  
"Wasp Junior" combines cleanly  
burning fuel efficiency, low weight  
and economy of operation.



Three-quarter Front View

To the individual owner  
"Wasp Junior" combines cleanly  
burning fuel efficiency, low weight  
and economy of operation.



Three-quarter Rear View

To transport operators  
"Wasp Junior" has a compact form  
of 30 1/2" x 30 1/2" x 30 1/2" including all  
main parts of engine and one service  
unit.

A 300 H.P. "Wasp" ... a product  
with a background of out-  
standing achievement ... a "Baby  
Wasp" ... with 80 per cent of its  
parts interchangeable with those of the  
world-famous "Wasp" and "Hornet"—that's the "Wasp  
Junior" ... which now invites your inspection.

Now only in name ... "Wasp Junior" combines expert  
engineering with the experience gained in military  
aircraft of flying. It has all the performance characteristics

Three-quarter Front View

To the individual owner  
"Wasp Junior" combines cleanly  
burning fuel efficiency, low weight  
and economy of operation.

Weighting 550 pounds and 49 1/2" in diameter,  
"Wasp Junior" develops 300 H.P. at 2,000 r.p.m.

To be manufactured in the most modern aircraft  
engine plant ... now under construction ... "Wasp  
Junior" will be produced to meet the full demands  
of the industry.

THE  
PRATT & WHITNEY AIRCRAFT CO.  
HARTFORD, CONNECTICUT  
Divisions of United Aircraft Corporation

Manufactured in Canada by Canadian Pratt & Whitney Aircraft Co., Ltd.,  
Limited, Montreal, Quebec, in accordance with license from Pratt & Whitney Aircraft Co., Ltd.

**Wasp & Hornet  
Engines**



## LABORATORY, TEST BLOCK AND FLIGHT

By every test -TP- Aero Motor  
Lubricating Oil plainly demonstrates  
its superiority. It represents a  
great stride ahead in the  
science of lubrication. -TP- effec-  
tively removes any cause of engine  
trouble—reduces the risk of flying.

-TP- Aero Motor Lubricating  
Oils are new—the latest develop-  
ment in scientific lubrication.  
They have been tested and ap-  
proved by leading manufacturers  
of airplane engines and by many  
leading pilots. They are straight-  
run oils, not blended or com-  
pounded, produced from pure  
paraffine-base crudes by a process  
for which patents are pending.

This process has worked ad-

vantages over other methods. It  
removes all the paraffine wax,  
while preserving all the lubricat-  
ing bodies in the crude. Elimina-  
tion of the wax is responsible for  
its low cold test.

In terms of performance this  
means uniform viscosity at all  
working temperatures, means no  
carbon deposit and ignition  
trouble from fouled spark plugs,  
easy cold starting, immediate oil  
pressure, perfect lubrication  
winter and summer, on the ground  
or at high altitudes—a maximum  
of safe flying hours.

A handsome, practical Pilot's  
Log Book sent free on request.

In  
Chest  
It's  
-TP- SCUD  
Aero Motor  
Lubricating Oil



Shakedown in  
Ohio  
Exclusively by  
The Standard Oil  
Company of Ohio

-TP- Aero  
Valve Spring  
Lubricant



Also  
-TP- Aero  
Rocker Arm  
Lubricant

TEXAS PACIFIC COAL AND OIL COMPANY  
FORT WORTH, TEXAS  
New York St. Louis Los Angeles

**-TP- AERO MOTOR LUBRICATING OIL**

DEC 14, 1939 1939



Swiftly built up  
the aviation center  
at Baltimore is now  
being completed

## A dream is becoming a reality—

ON the outskirts of Baltimore an army of workmen are busy erecting an aviation center unique in aeronautical history. On a single, unbroken tract ideally suited to the purpose will be concentrated the new plant and laboratories of The Glenn L. Martin Company, together with a landing field of exceptional character, a harbor for seaplanes and—ultimately—an aeronautical school, a home-community for air-wise sportsmen, and a hotel for transient visitors. Two and a half million dollars is being invested in immediate construction.



### The Glenn L. Martin Co.

Builders of Quaker Aircraft since 1909  
BALTIMORE, MARYLAND

# AVIATION

The Oldest American Aeronautical Magazine

THOMAS D. WATSON  
Editor

E. HARVEY BROWN, JR.  
Associate Editor

WILLIAM E. MYERS  
Technical Editor

EDWARD D. HARRISON  
Editorial Editor

WILLIAM J. BAKER  
Editorial Editor

CHARLES E. McFARLANE  
Public Affairs Editor

EDWARD D. HARRISON, JR.  
Publishing Director

HERBERT E. FORD  
Business Editor

WILLIAM D. HARRISON  
Construction Editor

CHARLES H. GAGE  
Editorial Editor

CHARLES E. BAKER  
Editorial Editor

JOHN E. BAKER  
Editorial Editor

## CONTENTS

December 14, 1929

Editorials	1141
The Safety Competition to Date	1146
The Importance of the National Sales Organization	1152
The Future of Air Express	1155
Reliable Powerplants for the Airship	1158
The Human Factor in Flying	1163
Making Airlines Pay Their Way	1165
Pirating of Trained Personnel	1168
News Sections	1171
What Our Readers Say	1188
Editorial Comment from the Daily Press	1188
New Volumes for the Shelves	1189
Abstracts and Reviews	1190
New Patents	1191
The Buyers' Log Book	1192

McGraw-Hill Publishing Company, Inc.  
Twelfth Avenue at 34th Street, New York, N. Y.

Single Copies 15 Cents

Subscription Rates: \$3.00 per Annum in Advance

Foreign Rates: \$4.00 per Annum in Advance

Single Copies 15 Cents

Subscription Rates: \$3.00 per Annum in Advance

Foreign Rates: \$4.00 per Annum in Advance

Single Copies 15 Cents

Subscription Rates: \$3.00 per Annum in Advance

Foreign Rates: \$4.00 per Annum in Advance

Single Copies 15 Cents

Subscription Rates: \$3.00 per Annum in Advance

Foreign Rates: \$4.00 per Annum in Advance

Single Copies 15 Cents

Subscription Rates: \$3.00 per Annum in Advance



In the  
foremost  
ships...  
since the dawn  
of the industry

**WYMAN GORDON**  
**CRANKSHAFTS**

WYMAN GORDON

The crankshaft makers

Worcester, Mass.

Harvey, Illinois



Thomas-Morse Aircraft Corporation  
Military type of ship using Micarta  
pulleys and fairleads.



Pulleys—See Advantages  
on Following Page



Fairleads



Bunge Bearings



Tube Tubing



Propellers

## Strength and Toughness in Micarta Aviation Products

Military and commercial planes must be built to withstand the effect of varying atmospheric conditions—moisture, heat, cold, as well as friction and corrosion. You are almost sure to find Micarta pulleys, fairleads and bungee-bearings on ships of this type.

The Thomas-Morse Aircraft Corporation, Pokier, Curtiss and many other well-known manufacturers have adopted Micarta for these applications because of its tough, wear-resisting, non-corrodible character. Micarta is also used for propellers and, in a different form for cabin lining. Write for complete information.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.  
EAST PITTSBURGH, PENNSYLVANIA  
SALES OFFICES AND SERVICE SHOPS IN ALL PRINCIPAL CITIES



## Westinghouse

Y 3000

### Aircraft Accessories

Micarta Propellers  
Micarta Control and Pulleys  
Micarta Fairleads  
Micarta Bungee  
Micarta Ply for Cabin Lining  
Micarta Tail Rotor Wheels

### Airport Lighting Equipment

Chemical Landing Field Roadlights  
Roadlights, Approach and Obstruction  
Lights  
Beacon Lights  
Reflector  
Transmitters and Micro-projectors

# AVIATION

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

A MONTHLY PUBLICATION ESTABLISHED 1911

EDWARD P. WARNER, Editor

VOLUME 11

... December 14, 1929 ...

NUMBER 11

## The President Compliments the Industry

**I**N HIS ANNUAL MESSAGE to Congress, President Hoover lauded, but with a strong endorsement of optimism and pride, reviewed aviation in America. Specifically he made the recommendation that "a revision of air mail acts upon a more systematic and permanent footing" be considered and that authority be granted for further expansion into South America.

Undoubtedly the first recommendation was influenced by the fact that the Post-Office Department charges \$24,000,000 of its deficit to air and ocean mail, and the latter shows strongly the influence of his desire to establish American industry in the continent to the south. Since his pre-inaugural journey to South America the President has never ceased to stress his interest in development to the south, and it is not a presumption to assume that he believes that aviation will do as much as any other single factor in accomplishing the ends of American commerce, trade and unity in that direction.

Coming from one conservative engineer-concrete the adjective "unshakable" is describing the accomplishments of American civil aviation is a gratifying tribute. It is pleasant to know that the industry merits so high a commendation but to a man like the President such praise has further implications. It means, it signifies, that he expects such progress to continue and its growth to his orderly, systematic, and conservative in order to earn his further expansion. Also, his recommendations as regard transportation in specific relationship to railroads, will undoubtedly be a joint factor with aviation.

No one aware of the facts doubts the President's sincere interest in our aviation program. Though indirectly under his jurisdiction when he was in the Cabinet, the remarkable achievements of the Bureau of Aeronautics was a reflection of his will and a safe tribute to his policies. His position for order, and attention to detail must be at times offended by the better-digger policies

which have been apparent in some phases of commercial aviation, and his dislike of waste of money, time and effort, must also have been accounted at the sight of the long-haired premiums and indirect methods manifest in certain elements of the industry.

All in all his approval of the industry was generous and optimistic and since the essentials of cool judgment, careful survey, and meticulous adherence to fundamental, practical and business principles, are apparent, his support of the American aeronautical industry will be forthcoming in the most substantial form.

//

## The Ends of the Earth

**C**OMMANDER BYRD has done it again. To those, if any such there be, who are sufficiently detached from personal interest in his expedition to regard it merely as a newspaper show the very consistency and regularity with which he carries through according to plan must become disappointingly monotonous. To gentlemen he opens new vistas, and they eagerly await such report of new territory covered and conditions encountered. To friends unimpaired, and to admirers who have known him only through his writings and his deeds, his flight over the South Pole merely confirms the confidence that they have felt in his unsurpassed talent for organization and in that indomitable leadership and almost flawless judgment which have so regularly adorned his objectives.

Geologists students of the science of weather, and makers of maps will draw manifold instructions from these trips over the heart of the great ice barrier. For the aeronautical world their greatest significance is more reason. We shall derive in due course, as we did from Commander Byrd's work in the Arctic and from the loaded operations of Wallinga and others, valuable information upon the behavior of airplanes under less-

naturally difficult conditions and upon the best means of keeping them in service in spite of extraordinary climate. He is indirectly determining the extent to which the seas around the Poles could be used as lanes for transport or for semi-permanent colonial operations. Most significant of all, Commander Byrd is still proving the way and offering encouragement for the more extended use of airplanes by other explorers and students of natural science.

Before Commander Byrd and Amundsen there had been half a dozen announcements of intention to use aircraft in studying the waste spaces furthest north and south. Ill-equipped and half-heartedly prepared, several had come to nothing, and all none had attained any very far-reaching results. Five years ago, the mechanical side of exploration was still essentially where it had been fifteen years earlier, in the days of the last great trip of the jetingly plodding Peary. Hereafter, no intelligent man will think of going forth on a major mission of discovery, whether to the Antarctic continent or the Mountains of the Moon, without creating himself to the full of the assistance that airplane and radio can afford. Airplane and radio existed several years before they were really used. It took careful demonstration at the coast boards of their possibilities, followed by spectacular demonstration, to make the explorer not merely positively conscious of their existence but constantly and actively aware of its effect upon his work.

Many men, in many parts of the world, have had a share in this work of demonstration. No other has done as much to promote it as has Richard Evelyn Byrd.

## //

### George T. Coddley

NO MILITARY ORGANIZATION judges the value of its members' services by their mark alone. The late Lieut. George T. Coddley had an influence upon naval aviation, by virtue of character and heroic professional qualifications, far beyond anything to which his rank and seniority might have entitled him. In his death the service has suffered a grievous loss.

Lieutenant Coddley's record at the Naval Academy had proved him a scholar. His work with a fighting squadron on the Pacific Coast had been one of many proofs of his qualities of leadership. His courage and his rare plating skill had been displayed in two Submarine races, and on other occasions unassailable.

More of all, he was a test pilot par excellence, and that means much more than mere flying ability. The duty that a finished airplane, accepted as sea-lantern, owes to the men who first tried it and released it and made suggestions for an improvement is seldom fully recognized. The mark of Lieutenant Coddley's shared and often critical judgment is upon each of the equip-

ment of naval aviation. He died in the work to which he had wholeheartedly devoted himself during a great part of his professional life. . . . putting a new phase to the armor test, and gaining knowledge upon which to build the provision of better flying equipment for the service to which he was devoted. This comrade, better than anyone else, makes how easily he will be missed.

## //

### Publicity That Helps the Industry

THE AVIATION INDUSTRY needs a new kind of publicity. This is not to say that previous standards and practices have been wrong. They served the needs of their particular era and gave the public certain essential facts and a considerable mass of heterogeneous information contributing to air-mindedness.

"Street" publicity, i.e., parades, jumps, refueling attempts, aerial wranglings and the like do not add appreciably to the dignity and air of respectability essential to the continued health of the business. Nor will statistics and generously established "reports" answer the myriad of questions the public is asking and which must be answered, directly or indirectly.

With the exception of the Lindbergh, Chamberlain and Doolittle, the dignified, unostentatious, and constructive workers whose contributions to aviation are not to be measured by temporal standards have been kept in the background—too much so, we sometimes feel. We cite the instance of Lieut. Harry Brown, line of the Army Air Service as an example. Lieutenant Brown, over a period of three years, daily risked his life and held as hundreds of test "ques" flights in an effort to analyze this feature of flying and to subdue its influence. His record, modestly given and modestly received, was a model from the War Department and a honor paying job in the industry. In that connection and apropos of our intent, it is amazing the amount of blarney which has been given the "tail-pipe" in connection with airplane accidents. Anything which could not be otherwise explained by the laymen in connection with a crash was promptly attributed to the tail-pipe. Reddies flying, negligence, and mechanical and construction faults—everything in accident have been habitually credited to this somewhat conspicuous misnomer and few officials have been as within the industry to correct this impression. "Air-cockets" had made the same history.

All of this leads to an inevitable conclusion—that the relationship of aviation to the masses must have a new and broader interpretation. Instead of selling a piece and want of safety, the public must come to understand that it is regarded as just another element of air transportation. . . . that all airline operators are governed by the same principles, that the government agencies of treatment and control are doing all possible to

eliminate every doubtful element from airplane operation. Vigorous argument and industry positioning of public interest with undue stress on the word "safety" inevitably run up in many minds its most opposite.

On the other hand, dignified presentation of important news, interpretations of policies, and occasional consideration of the fact that the public is generally interested primarily in the business and industrial background, rather than in its statistical and spectacular phases, is bound to result in greater confidence and, incidentally, larger pay loads.

## //

### Salesmanship at Aircraft Shows

THE LACK of real salesmanship has been most conspicuous during the 1928 aircraft shows. It is not enough that airplanes be attractively displayed and then left to speak for themselves. Neither is the purpose of a show to reach the "live" prospects only, for then shows would have no purpose, since most live prospects can be ferreted out and approached without going to the expense of an elaborate exposition.

Shows are instruments of sales education, unconsciously recognized as the finest way to stimulate the market for any newly sold product. The basic object of a show should be to get within its walls all persons seriously interested in the products shown and then to instruct those persons that they will have shop around among various dealers with the object of purchasing and using those objects.

Every booth and exhibit in future shows should be well attended by energetic salesman who can and will talk intelligently to everyone that can be talked to stop and listen. In no many shows of the past the public has come in one side, done a marathon talk around the hall and gone out the opposite side leaving a kaleidoscopic impression of what should have been examined in detail. Adequate provision of comfortable chairs and lounges will help to reduce this tendency to hurry through. More attractively arranged and lighted exhibits and the order line of out-ways models, powered structures, moving exhibits and small moving picture machines carrying interesting sales pictures and messages will also serve to focus the interest of persons on products so displayed. Sell another point with respect to airplanes is the wisdom of arranging for people to climb in and sit down, thus giving them an opportunity to visualize aerial sensation. The slight danger which may be sustained by the up-lifted wing will be more than repaid by the intense interest which the prospect gains in this particular machine.

Sell another one spot at just exhibits has been the problem of children and particularly of boys is everywhere. Many exhibitors have concluded that they were an untapped resource and should be turned, and a

must be admitted that they collect most of the literature, do most of the damage, and are constantly in the way. However, here is a growing realization that the "boy market" must be addressed by the company with an eye for the future. The fact that boys of fifteen and sixteen will be live prospects in a few short years should in itself justify their attendance and encourage a respectful attention to their questions. These are other angles, however, and not the least of these is that a very great percentage of show attendance is on the part of parents literally "dragged in" by enthusiastic youngsters, and that this same enthusiasm on the part of the younger members of the family will many times serve to interest and sell persons who might not be so easily reached by any other way. By distributing literature to the boys it is carried into many homes and their eagerly explained to the grown-ups. No body of sales representation is doing more to sell aviation intensively in every home than are the boys and their encouragement by the industry, and especially at the shows, is the only sure course to follow.

## //

### The Air Passenger as a Lost Opportunity

IT IS SAID that even the speed of the pig is put to some good use by the technicians of the Chicago stock yards. The aviation industry, with its great problem of selling its services to the public, should not lag behind the discarded butchering business in utilizing every factor which can help out in merchandising.

During the month of August there were 11,724 pay passengers who arrived at or departed from one American city over regularly operated transport air lines. The total for the entire country would be even more imposing. The total number of people who flew is all types of planes and services over the country during that one month is staggering. Yet so far as these people are represented possible purchasers of airplanes they have been allowed to pass unobserved.

Especially in the case of the airlines it is a simple matter to record people's names and addresses. Where there is a factory-to-office hook-up, as is true of most transport operations, the supplying of these names and addresses to the factory sales department should be a simple matter. Where factories have no such ready source of names of air passengers there should be men developed of collecting and supplying them.

It is an irony of selling that the personal touch covers sales, and is born into air passengers are a real opportunity. If the proper sort of direct and literature be directed at this group it will ultimately register in a fashion very pleasing to the sales department.

# THE Safety Competition TO DATE

*Contestants Dwindle to Three as Several Withdraw*

By LESLIE E. NEVILLE  
*Technical Editor of AVIATION*

SINCE our last writing on the progress of the Guggenheim Safety Competition (AVIATION, for November 18, 1929), the status of the contestants have been considerably diminished and at the present writing there are three contestants actually in the running and one other entry making repairs on his airplane which were damaged by landing on the day it was officially presented. Unfavorable weather has delayed the trials and progress has been much slower than originally anticipated by the contest committee. In an effort to tie the two pilots and judges have attempted to conduct the trial flights under the most favorable conditions and have agreed so that no effort is to be made.

The closest in progress that are actually in the contest are the Curtiss-Tanager, Ford-Lugh and Handley-Page. Of these the Curtiss and Handley-Page have passed a large number of the tests, while the Ford-Lugh just recently began its trial flights. An absolute dead heat of December 23rd has been set in the case of the McDonnell entry which was delayed in several days to unfavorable flying weather, and which damaged its propeller on one wing and one wheel shortly after its arrival at Mitchell Field. The airplane has been shipped to Milwaukee, Wisconsin, where repairs are being made and is being rushed in an effort to meet the deadline and return to Mitchell Field in time for the tests. It was stipulated, however, that the plane will be eligible for one of the ten thousand dollar prizes provided the contest is in progress when it is presented.

In our last article we airplanes were still officially entered in the contest and the status of the McDonnell entry was not known. During the intervening period, the Platt, Burnell, Beardsley-Taylor, Connelley-Hall, and Schneider-Winterbotham, were withdrawn for various reasons. The latter withdrawal followed the crash of the plane on November 21st. The Burnell machine was taken to Keyport, N. J., in-

sufficiently after its presentation, for certain modifications in the design. A deadline of November 30th was set for its return and, as nothing has been heard from it, it is assumed that it is abandoned, abandoned. Still no word has been received from the Autogiro which were awarded with interest by many who are following the contest. The Rockwell entry which was also expected, even after the closing date, likewise failed to appear.

WHILE technical details were not forthcoming from those in charge of the Handley-Page airplane entered in the contest, the machine appears to be of conventional design and construction, with the exception of the sandbars of slots and flaps. It is a biplane having upper wing of greater span than the lower and is powered with the 150 hp. Armstrong Siddeley Monospace engine. The airplane has a single empty of 1,363 lb. and a gross weight of 2,150 lb. Slots are used along the leading edges of all wings and opposite in conjunction with the trailing edge flaps, the action being entirely automatic and not in any way directly controlled by the pilot. An interesting detail of the slot mechanism is a series of graduated scales on the lower surface of the auxiliary wing apparently intended to indicate the width of the slot in the slot. One of the features of the airplane is the Townsend ring covering, a relatively recent British



development comparable to our NACA covering, but differing in that it does not enclose the propeller to such a high degree as the latter.

As mentioned in one of our previous articles in the Guggenheim competition, the Ford-Lugh Safety Wing Plane is simply a production model Brewster-Wheeler Bird biplane having a small auxiliary airtail above the leading edge of the upper wing. The auxiliary portion is somewhat larger than that of the conventional slot design and is set at a smaller negative angle to the main wing chord than that of the section forward of the Handley-Page slot when it is in open position. The Ford-Lugh entry is powered with the Kinner K-5 radial engine which is the standard power plant of one of the Bird biplane models.



In top: The dominating safety machine Handley-Page biplane showing the slots and flaps. Above: A shape of the Townsend ring covering on the plane. The covering is comparable to our NACA type.

Construction of leading edge slot and trailing edge flap is employed in the low wing monoplane entered by J. S. McDonnell, Jr. and associates, an organization formed especially for the purpose of competing in the Guggenheim contest. This machine is an open, two-place tandem, strut braced type powered with the Warner Scarab engine.

Special wheels and tires with vertical Gloe shock absorbers designed for a deflection of 15 in. are used in the landing gear which has a track of 42 ft. The McDonnell plane has a metal structure, the fuselage being built of aluminum alloy reinforced with steel for ribs and struts while the wings have tubular ribs, shearweb alloy box beam and steel drag bracing. Aluminum alloy tubing is used throughout the tail surface structure and fabric covering is employed for the entire structure.

A construction of variable area and camber is employed among the many interesting features of the Burnell airplane built by the Upper-Burnell Corporation in the plant of the Aeromarine-Klemin Corporation at Keyport. This airplane embodies a number of the features incorporated in former Burnell machines. The most noteworthy of these features is the idea of a gossamer airfoil body or fuselage intended to contribute lift by virtue of its airfoil shaped profile. As in the case of former Burnell planes, this machine, which is purely

experimental, is powered with two Curtiss engines mounted as closely as propeller clearance permits in the leading edge of the structure which constitutes the fuselage. These engines are mounted in such a way that their longitudinal center lines are inclined outwardly at a small angle to the line of flight in the horizontal plane. This has been done in an effort to provide airplane rudder control when one engine is used alone, and is a feature incorporated in former Burnell machines. The variable area and camber device is a development worked out by Mr. Burnell in collaboration with Mr. E. Charles Wilford several years ago. The wing section is of variable thickness and the portion between the spars is rigidly mounted and braced. The design is such that the nose and trailing edge present mean outward and downward, changing the curvature as well as the area. This is accomplished by a rack and pinion mechanism with pinion gears mounted every five feet on two bevel shafts running parallel to the spars. The shaft running parallel to the forward spar is controlled by a hand wheel in the cockpit, while the trailing pinion in the rear spar is driven by a chain from the forward one. The pinion gears actuate curved rack members, the ends of which are attached to the movable nose and trailing edge. These rack members are mounted on rollers in guides and their movement provides the necessary change in camber. With



The Warner plane (McDonnell entry) showing some of the special features.

the object of maintaining a minimum of center of pressure travel, the mechanism has been designed to admit greater motion to the nose section than to that of the trailing edge. Sweep angles are placed at appropriate intervals to prevent the aerodynamically flexible portion of the skin from crinkling. As previously mentioned, the airplane is constructed of metal throughout, aluminum alloy being used for the greater portion of the wing structure, the magnesium alloy being employed in the construction of the ailerons and controls.

Another noteworthy feature of the Barnhill airplane is the landing gear which is of the four wheel type and is designed to eliminate the tail skid, this being necessary because of the high position of the tail which is supported as a strut from the vertical shaped fuselage. The rear wheels, which are 22 x 30 ins., are larger than the front ones and are mounted approximately below the center of gravity with no provision, other than the MacPherson type, to absorb shocks in landing. The forward wheels are considerably smaller, being 12 x 5 in., and are intended to prevent nosing over. They are mounted a few feet ahead of the rear wheels and the spars on each side are braced in stream-line fairings. At the rear of each of these fairings is a small spring which runs in some degree like a tail skid and prevents the tail from coming in contact with the ground under certain landing conditions. When the Barnhill plane was first submitted, the ailerons were mounted at the wing tips and controlled by cables from the cockpit. Later this feature was modified and ailerons of considerably less chord and higher

aspect ratio were mounted below the wings near the tips.

The Barnhill plane has side by side seating arrangement and is of the open type. The span of the fuselage with tip ailerons was 49 ft. and the length overall 26 ft., while the wing area was 216 sq ft. The fuselage is 8 ft. wide and 15 ft. long, while the overall height of the plane is 9 ft. 4 in. The weight empty is 1,640 lb. and the gross weight is 2,390 lb.

VARIABLE incidence in the outstanding features of the entire monoplane submitted by the Taylor Bros. Aircraft Corporation and in practically all other respects the machine was a stock model. The Taylor plane is a so-called cabin monoplane powered with the Kinner engine and has a 34 ft. span, 5 ft. 6 in. chord, 22 ft. 6 in. length, providing an area of 175 sq ft. The weight empty is 1,335 lb. and the gross weight 1,635 lb. The variable incidence feature provided a range of 7½ deg. and was controlled by a hand wheel under the pilot's seat of the cockpit. This hand wheel is connected by sprockets and chains to two vertical screw adjustments linked to the wing panels. The spars are rigidly braced by struts and the wing ribs are hinged to the spars to provide the necessary variation in incidence. An aileron system employing the Clark-Y hinged flap developed by Mr. Taylor to provide greater thickness than the standard section, is employed. Flange construction is conventional, while the hinged wing ribs are built of aluminum alloy and the spars of wood. Ten inches of deflection are provided in the landing gear shock absorbers and MacPherson wheels were to have been used on the plane in the contest.

As previously mentioned, the Kinner powered Fleet entry was a conventional model having the addition of trailing edge flaps on all wing panels and a vertical fin adjustable in flight. The airplane was also provided with ailerons which can be had as optional equipment with any Fleet plane purchased. Slight changes in structural dimensions included placing the tail post 6 in. further aft and the wings 2½ in. further aft. The horizontal tail surfaces have a span ten per cent greater than that of the stock model, while the shape of the fin is somewhat modified to increase its area. The adjustable fin is operated in the same simple and ingenious manner as that of the standard tailfin adjustment on the Fleet and a very simple mechanism was designed to control the flap from the cockpit, consisting merely of a hand lever, two short shafts and another longer lever serving to actuate the lower wing flap, which are connected to those of the upper wing by struts.

In this and the two pages following are present detail photographs and sketches of the remaining original entries in the contest. Although these have been withdrawn they were considered sufficiently interesting for publication.



Above: Tail section view of the Barnhill monoplane.

Above: The tail group showing double vertical surfaces.



Left: Ailerons on the machine as it was first officially presented at United Field.

Below: The most unusual landing gear and wheel deflection, note the struts at the rear of the landing gear.



Above: The aileron installation as it was modified at the United Field.

Left: General A. Barnhill designer.



Right: Sketch showing the variable incidence of the ailerons within the wing of the Barnhill plane.

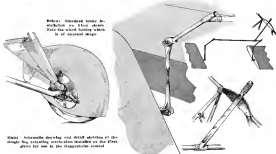


Above: Detail sketch of the method of attachment of the front landing gear struts, the fuselage.





Left: The Vines triplane with flap down

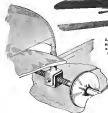


Before standard landing mechanism on Vines plane. Note the wind flaps which is at second stage

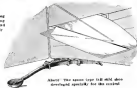
Right: Schematic drawing and detail sketches of the single flap retracting mechanism installed on the Vines plane for use in the O'Connell contest



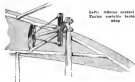
Left: The plane with flaps up



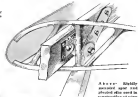
Left: The retracting mechanism showing use of rollers and drag groove pulley



Right: The same type tail wheel also developed specially for the contest



Left: Schematic drawing of the variable resistance mechanism



Right: Slightly modified gear used in construction of wing



Left: The Vines triplane and its designer

Right: Schematic drawing of the variable resistance mechanism



Left: The retractable landing, rubber banding control system. The principle was employed by the rubber control



Right: Showing how position of the variable resistance was



Right: Detail of lower end of variable resistance mechanism showing its retracting device

# THE IMPORTANCE OF THE National Sales Organization

**P**ERHAPS the greatest asset of the sales organization of the Travel Air Company, based at Wichita, Kan., is that its governing body realizes that there are other airplane companies manufacturing good airplanes. They realize that theirs is a highly competitive field, and that regardless of the quality of their products, which they quite naturally endeavor to be of the best, they must build up, and maintain, a sales and service organization that will get their products into the hands of purchasers, and, what is perhaps even more, keep them, purchasers as perpetual Travel Air customers and buyers. The fact that a good portion of each year's business is repeat business indicates that the sales department is enforcing its policy.

When first starting out to build up an efficient and successful sales and service organization, the Travel Air Company was so wise enough to avoid the mistake that has been made by more than a few manufacturers of airplanes—the mistake of signing up distributors regardless of their ability to distribute airplanes. It is very regrettable that a great many manufacturers have paid little or no attention to who they signed up as distributors. Numbers, rather than quality, seemed to be the value of the day. If John Jones had the figure three John Jones got the contract whether he was a good buyer or not or not. True, in all things, has brought out the worst of the native and is unfortunately for most manufacturers and distributors alike. Has resulted in the expenditure of many successful dollars, and with no benefit to the sales buyer at all.

But to return to the sales organization of the Travel Air Company, the subject of this article. That group of producers made it a point to build up a distributor organization composed of business men rather than unscrupulous operators, pilots, and a lot here you?

Whether the commodity be a house, laptop, or an airplane, the methods of placing it upon the market and building up that market are fundamentally the same. Good merchandising is not the efficient application of power selling principles to a given problem, but the addition of various new or changed methods called for by the type and kind of product being merchandised. Therefore, it follows that the business man who



A Travel Air plane. The right-hand model presented to the United States Air Force. The left-hand model presented to the United States Navy. The right-hand model presented to the United States Army.

uses who has had experience in creating, building up and maintaining markets. . . . particularly if he has had that experience in allied industries. . . . is undoubtedly a far safer bet for the airplane manufacturer than the coffee-shop pilot, or contracted person who knows airplanes but little or nothing about the business of really selling and servicing them. True, that knowledge can be obtained, but the amount of time elapsing before that knowledge has been obtained is an expense that no man very well be borne by the manufacturer.

Thousands of organizations of businessmen-distributors the Travel Air Company made all sorts of mistakes and did a very large amount of advertising in newspapers and other publications. The expense was, according to the officials, most gratifying. Then came the process of selecting those persons who gave indication of becoming an asset to the company. Some of the applicants were possessed of a knowledge of both aerodynamics and business, and of course those men were signed up to get on. However, there was no terrific effort to get



By R. SIDNEY BOWEN, JR.  
Associate Editor, AVIATION

distributors' signatures on the dotted line. Each and every applicant was thoroughly investigated before final arrangements were made. The result has been that few Travel Air distributors have since proved that they could not make the grade.

Let it not be felt that we are underestimating to place the value organization of the Travel Air Company upon a pedestal where all may view and admire. There are other manufacturers in this industry who also have efficient and productive selling organizations. We are but merely striving to drive home the importance of thought and consideration in the matter of building up a distributor organization.

The sales department is the nerve center of any manufacturing company. Its poor operation in the matter of

building up and maintaining national, or local, representation can sell a product in a very short space of time. Individual history is full of cases where a good and useful product has died on the market due to poor selling methods.

When signing a distributor contract with the Travel Air Company the former has to guarantee a certain quota of planes to be disposed of during the year. The amount of the quota is fixed after an intensive prospect analysis of the distributor's territory conducted by both the Travel Air sales department and the distributor himself. In making the analysis such items as size of territory, population and wealth are considered.

The most trade discount is allowed on the first plane ordered by the distributor, but as a means of insuring that over present possibility of the distributor buying one plane at discount and then going out of business a reasonable deposit on the entire quota of planes is required. . . . and made. Of course each distributor is assigned a definite territory and the usual adjustments made for map over-lapping of territories.

To insure perfect co-operation between the factory and the national selling organization the Travel Air sales department divided the country into sections of equal geographical size and in each section placed a district sales manager, or sales supervisor. These men are on the Travel Air payroll and it is to them that the Wichita office looks for efficient and productive functioning of the national organization.

A district sales manager's duties consist chiefly of conducting the sales outfit in his district, or section. He assists the distributor in the matter of selecting desirable sales, making territory sales surveys and



Walter E. Mack, president of the Travel Air Company. Under the Travel Air plan.

*Regardless of the quality of a product, it is the manner in which it is merchandised that makes for the success or failure of that product. Due recognition of competition is absolutely essential to efficient and profitable merchandising, and in this respect the Travel Air Company, of Wichita, Kan., has, and is, functioning 100 per cent. Upon that principle has the Travel Air Company built up a national sales and service organization composed of businessmen who have the ability to merchandise Travel Air products, hold their markets, and create the type of customer good-will that makes for increasing repeat sales business.*



In addition to assisting the distributor, and handling the orders, it is every way possible, the district sales manager is always on the look out for new distributors. When such a person is ascertained, and looks promising, the district sales manager makes out a most detailed report and forwards it on to the factory for consideration and possible approval. The same policies and methods are followed in the matter of assisting and appointing dealers.

These reports, known as Travel Air Distributor and Dealers' Facilities Reports, when completed, find out available the Wichita office to get a most comprehensive word picture of the applicant's business history, past and present. Every possible bit of information that would be of help in making up the applicant is contained in the Facilities Report. In that way, the home office is better able to build up a better selling organization. To be brief, . . . , gets word is returned to the managers who are selling and appointing Travel Air dealers and distributors.

However, be it understood, that the factory interest in the business equities of its national selling organization does not stop with the signing up of dealers and distributors. Each month every dealer and distributor gets a complete statement of the past month's activities, and leaves plans, and needs in to the distributor under whom he is working. And at the end of each month each and every Travel Air distributor analyses his dealer's reports and makes out one for the home territory and sends it to the Wichita office.

There is very little chance of either dealer or distributor misleading the Wichita office, regarding activities, for every district sales manager makes out a daily report of the calls he has made, conditions found to be existing, new selling prospects discovered, etc. . . . Thus the home office is able to keep a go-any-where hour check or development all over the country.

The serious angle is handled in much the same way . . . that is, there is no separate servicing organization, no independent representatives, Travel Air service and parts Travel Air sales. Most of the distributors carry a complete stock of Travel Air parts, and it is the ultimate goal of the Wichita office to have every distributor carry parts made for substitution to their dealers. The amount of parts stock is of course based on plane population in the distributor's territory. Every distributor is furnished by the factory with complete information on assembly and repair, as well as a very well made up parts catalog. That difficulty encountered in the matter of distributors ordering parts . . . by using standard . . . was instrumental in causing the factory to spend considerable time and money on the preparation of a

catalog which even the dumbest dealer can understand. As a means of handling out-of-town emergency calls, every distributor has a service plane that is always ready for instant use. And as a further precautionary measure that Wichita office mail maintains a similar service plane. Its value has been proved on more than one occasion, according to the sales officials.

THE ALL IMPORTANT ITEM of advertising is another thing in which the Travel Air Company has employed sound business judgment. Perhaps one of the quickest ways for a manufacturer to break down the morale of his national service representative is to compete with them. Factory-distributor sales competition has been successful on a few rare occasions, but as a general policy it is highly destructive to the maintenance of maximum national sales volume. Naturally, factory advertising which is not aimed in character and content, and not reproduced for the benefit of the national selling organization, is a most divided form of factory-distributor sales competition.

The Travel Air Company does nothing but national advertising. National advertising that carries the name of Travel Air to the general and industrial public, and which backs up the efforts of Travel Air distributors and dealers. All retail advertising is handled exclusively by the distributors and dealers themselves. However in this matter every distributor and dealer may call upon the factory for assistance in the matter of preparing such advertising and the matter of selecting the most probable mediums. On the Travel Air payroll is a permanent well qualified in the art . . . of advertising, and it is his job to cooperate with the national sales organization in the matter of advertising. In addition to rendering its national selling organization a specialized advertising advisory service, the Travel Air Company also furnishes the distributors and dealers with advertising literature such as folders, pamphlets, brochures, etc. for use in connection with their local direct mail campaign.

While the advertising policies followed by the Travel Air Company are not new, even in the aerospace industry, they are well worth the consideration of more than a few American airplane manufacturers. Too little attention has in the past been paid to advertising by airplane manufacturers. And in view of the fact that . . . believe it or not . . . the American public is not as yet sufficiently attuned to be considered a ready airplane market, it follows that, as in every other industry annual advertising, in all of its forms, is the one great means by which the American aeronautical industry can create, build up, and maintain a profitable market for its products.

## THE FUTURE OF Air Express

By COL. HARRY H. BLEE  
*Aeronautics Branch, Department of Commerce*



AVIATION is destined to play a vital role in the transportation of money and merchandise. In the past, aerial express has been negligible; at present, it is still in its formative stages, but its further development in the immediate future is inevitable. That air express offers an exceptional opportunity for expansive development is indicated clearly by the fact that last year, the Railway Express Agency, Inc., which it paid to be about 80 per cent of the entire total express business, handled 178,447,912 packages and transported a total of 12,134,488,616 lb.

It is true that aircraft and airways are already being used in connection with express, but 12 or more different airlines are now delivering express directly to and from some 82 American cities. But so far, we have barely scratched the surface of aviation's express possibilities.

If you doubt this for a moment, consider the evidence offered by the attitude of the military express companies. President Robert H. M. Cowles of the Railway Express Agency, for example, says: "We are interested in commercial aviation not only as a potential source of profit in itself, but for the influence it will have in promoting the expansion of our rail business by opening new markets to all lines of commercial enterprise."

What we need is planes in regular service with capacity of 25,000 lb. and the ability to carry a payload of at least 5 tons. When our airlines are equipped with such units, commercial aviation will follow the course of every other transportation system. That is to say, the profits from the low volume emergency traffic, including the paper work of business which can pay almost any

*At the present time there are 12 or more different airlines delivering express directly to and from some 82 American cities, yet, according to Col. Harry H. Blee, we have thus far hardly scratched the surface of aviation's express possibilities. Colonel Blee "presents his case" in an exceptionally interesting and informative manner. His conclusion is that . . . "the foundation is well laid for a thoroughly organized, nation-wide air-express service; and its further development in the immediate future is inevitable."*

price, will shrink into insignificance in comparison with that to be obtained from the regular and consistently increasing flow of routine merchandise.

To get this done, we must stop marveling at the little narrative of most successful and open our eyes to the colossal drama of American business which is no big that most of us expect see it.

Mr. Cowles, having been in the express business for more than 45 years, knows whereof he speaks regarding the potential tonnage of aerial express. His lesson has consequences on the undeniable fact that American business, appreciating the full significance of the trueness "time is money," is resolved to reduce costs wherever and whenever possible by saving time.

That is why \$25,000,000 worth of small merchandise leaves New York City each day, by express instead of by freight. That is why a single express company now flies 500 railway express cars every night in New York, and handles in its 28,500 offices throughout the country approximately one million express packages per day. Just as these shipments are made today by rail because it is three times faster than freight, so will an increasing volume of tomorrow's shipments go by air express which is three times faster than the fastest train.

IT IS APPARENT from these figures that hundreds of huge aircraft planes will be required to take care of even a small portion of the nation's total express business—hundreds of air express transports which will operate at lower rates than are now possible, with reasonable profit to the airlines and shippers.

But why will American business resist upon long

Front quarter view of a Travel Air aircraft, manufactured April 1939.



air transportation for its valuable express?" you may ask. The answer is, this faster transportation will not only save weight on railway, securities, and goods in transit but will also facilitate the distribution of style merchandise, perishables, and other shipments the nature of which demands the highest possible speed of delivery. Furthermore, air express will effect an appreciable reduction of inventory for thousands of item-bearing houses, which in turn will permit reduction of prices—thereby widening markets and increasing total sales volume.

Cen. John P. O'Han, president of the Colonial Air Transport, Inc., makes this comment as the potentialities of express air shipment from the viewpoint of its interest in commercial aviation. It came to him that within a reasonable period of time the point-to-point of an express would exceed the weight of passenger carrier. At the present time, of course, this is not the situation. The important point to bear in mind is, that, with an air load of a reasonable tariff for air express, the profit to the air carrier will be greater with a given weight than the return from carrying passengers. The air express package is merchandise and merchandise, and the liability for its damage or loss is consequently less. The package requires no attention or service. In the case of the passenger, special supplies not required by air express are necessary. The contingent damage by injury to, or loss of, the passenger, in comparative injury. The hazard is greater. Many other comments might be made in the general connection. The point is that the air express is a promising field for development.

According to Clement M. Keys, president of the Carnay Wright Corporation, "It is in the air express service that business and public will find the greatest immediate convenience and practical use. Anything that is light and valuable, such as furs, jewelry and hats, or that is small and valuable, such as jewelry, makes ideal air express matter. Today you can live in New York City and have your goods moving on their backs in the Midwest at noon yesterday! In Chicago you can have a pair of shoes sent flying to its bed in the form of the Adams air line in the day before."

Money by the million of dollars is being carried for big banks, Mr. Keys adds. Money is also when in transportation, that is, it is not carrying income. The quicker it can be converted from one point to another the quicker it can be put to work again. That is why air is three times faster than by rail and sometimes five times faster and bankers aren't slow in taking advantage of this. The air is a safer way to ship money.

Mr. Keys points out that Chicago and Detroit merchants have been able to advance orders of their style while still in advance of competitors by use of the airplane express and that now merchants are making hats, dresses and lingerie across the country to Midwest and western cities.

Valuable merchandise worth many millions or dollars is always in transit, and every hour which can be removed from this transit time represents a distinct saving. It has been estimated that eight to ten billion dollars is chargeable to waste in the cost of American business every year—a waste which again is against the whole of America's foreign trade loss. Obviously the transportation part of this waste can be reduced appreciably by speeding up the movement of money securities, and valuable merchandise and thereby cutting

down the time lost in transit. American handicrafts goods are elegant with the fragile fabrics of retails and manufacturers who have not yet learned the extreme necessity of saving time. Head-to-tooth saving is proving a potent factor in our national prosperity but there are still many millions of dollars' worth of merchandise tied up on stalled or delayed shelves.

Through the intelligent use of a despatching air express service, a part of this capital might be made available for other purposes. It is significant to note, in this connection that in Germany over 2,000,000 lb. of freight, not including mail or printed matter, were carried by air express operators in 1928. Their air freight service is used to transport money from the commercial banks in procuring a valuable loan to many German industries. It is used not only for the transportation of securities, flowers and perishable goods but also for moving patent files, medicine, sample goods and other merchandise of widely differing nature.

Carriers of the Luft Hansa Company have found that fragile merchandise can be transported much more safely by airplane than by rail because vibration and rough handling are virtually eliminated. Another important factor is the elimination of heavy customs and packing material, which greatly reduces the weight of the article and therefore the tariff to be paid on it. As the result of an agreement entered into last year between this country and the German Imperial Railways, freight can now be sent to any point in Germany where there is a rail station, through the combined facilities of air and land transportation.

The transportation of jewels, securities and other valuable cargoes by air is nothing new on European airlines, but recently Imperial Airways established a record for carrying Indian jewelry. During just one day in the latter part of July, forty-one tons of gold jewelry were transported across the English Channel from London to Paris—air express shipments totaling \$25,000,000.

In the United States many specific instances might



Handling air express at Los Angeles for delivery in Kansas City

be cited showing the use of air express. Many businesses from food sending not only light and perishable goods but commodities by air but this is not true today, and bulky goods. Machinery and engine parts, dies, toolbits, hardware, fruits, vegetables, cut flowers, dry goods, medicines, newspapers, jewelry, advertising cards and waste carriers and babies, motion picture films, plans and specifications for building projects, all forms parts of the express which are now being flown daily over our air express routes.

As a concrete example, six special refrigerated planes are being used to fly fresh fish from the Gulf of Mexico to Brownsville, where they are packed for shipment to northern cities—the planes average over 3,000 lb. of fish packed in dry ice during the six trip.

Obviously many other regular commercial applications of air express might be cited. This is evidenced by the fact that during the past three years, American airlines have transported \$1,644,826 lb. of express matter. Many, many operators now are planning their schedules so carefully that they are able to give equally good service in both directions.

In addition to the regular commercial use of air express, there are countless cases of emergency use. For example, an important express agent for a winter park in California was recently forwarded from Ohio. This was handled by air express from Cleveland to San Francisco, with a resultant saving of three days' time which is sure to send the winter supply of the community before the snow's native was exhausted.

Airborne in general shipment of almost every type can be sent by air; present shipments are usually limited to those whose value does not exceed \$5,000 including money and securities. Single pieces may be shipped which do not weigh over 500 lb., perishables, when properly packed and of a character to cause no damage to other shipments, and scores of other miscellaneous types of merchandise, when packed, marked and labeled according to express regulations.

The air express service of the Railway Express Agency, Inc., which is receiving express, perishable commodities, sporting goods, routine supplies, small machine parts and a host of other things, but will not accept very few shipments of any kind, explosives or highly inflammable matter, nor articles which are extremely fragile. The company specifies that unless special arrangements are made in advance, no single piece should be more than 60 in. long or more than 19 in. wide, that if over 40 in. long the depth should not exceed 4 in., and that the combined length and girth of an express shipment should not exceed 106 in.

Air transport operators now divide an air express service under contracts with Railway Express Agency, Inc., include Boeing Air Transport, Inc., Clifford Bird, Inc., Continental Air Lines, Embury-Riddle Company, National Air Transport Company, Inc., Northwest Airways, Inc., Pacific Air Transport, Robertson Aircraft Corporation, Thompson Aeronautical Corporation and Western Air Express, Inc.

While America's air express service is now being operated only over certain designated airways with scheduled stops at some 82 cities, it is available to all shippers who find that their time can be saved or personal interests served by using air transport for all or part of the travel of their shipments. Direct air express service today is available between Boston and New York, and between



Mail and air express route from Boston to New York

New York, Los Angeles and San Francisco and intermediate airports—making possible late next-day delivery from New York to Pacific Coast points. It is also available between Pittsburgh, Cleveland, Cincinnati, Detroit, St. Louis, Tulsa, Minneapolis, St. Paul, Omaha, Pueblo and intermediate airports, between Los Angeles, San Francisco, Seattle and intermediate points; and between Los Angeles, Albuquerque, Wichita, Kansas City and intermediate points.

Within the past few weeks the Colonial Airways System announced an express service between New York and Boston via plane. For a fee of \$5 per package, Western Union messengers pick up and deliver the packages while Colonial representatives take charge of the transportation by plane—the only conditions imposed being that the package be wrapped securely and might not more than 5 lb. In other words if you live in New York you will simply ring for a Western Union messenger boy and have him your package. Just four hours later it will be delivered to the house or office of the addressee in Boston. Similar arrangements for pick-up and delivery thereby affords a fast rate in trade between cities widely understood, be affected by air express operators throughout America.

Three years ago scheduled flying operations to the United States amounted to only 4,000,000 miles during the entire year. During the first six months in 1929, 48 air transport companies flew planes of various types a total of 8,000,000 miles, which shows an increase of 300 per cent. If the development of airmail service continues at its present pace, the total miles flown during 1929 will exceed the aggregate of the three previous years combined. Airways already in operation in the United States total 30,000 miles, of which 10,000 miles are scheduled for night flying. Our transport planes are now flying approximately 75,000 miles per day—or the equivalent of 90 trips entirely around the world every month in the year.

The foundation is well laid for a thoroughly equipped, nation-wide air express service, and its further development in the immediate future is inevitable.

# RELIABLE Powerplants FOR THE AIRSHIP

*Interesting Facts Regarding Their Requirements in Operation, the Four Out of Five Failure of the Graf Zeppelin*

By LIEUT. COMDR. JAMES M. SHOEMAKER  
U. S. Navy

THE Achilles heel of an airship is its powerplant. An airship without power is a balloon at the mercy of wind and weather. Conversely, an airship with power plant subject to injuries to weather for it can avoid storm areas and keep clear of land storms. The recent world-famous flight of the Graf Zeppelin was completed almost without incident. The engines functioned perfectly, and dropped along at whatever speed was required of them.

We have been accustomed to thinking of aircraft engines in terms of airplane requirements. An engine suitable for airplane use has been considered as fitting all the needs of an airship engine. As a matter of fact, this is not the case. In some respects an airplane engine exceeds the requirements for an airship engine; in other respects it falls far short. The underlying reasons for this condition are based on the differences between airplanes and airships.

The fundamental requirements for an aircraft engine (airplane and airship alike) may well be repeated here. They are: minimum weight per horsepower; maximum cost, maximum reliability; maximum durability; maximum ease of maintenance; maximum economy; and maximum thrust per horsepower. The requirements of outstanding importance in airplane engines are reliability, weight per horsepower, cost, thrust per horsepower, and economy. In airship engines the order of importance is greatly modified. Durability and economy are paramount.

It seems anomalous to stress reliability in airplane engines and not in airship engines, but this anomaly is more apparent than real. Airships do not require the same low weight of power plants as do airplanes, hence airship engines are not under the same restrictions as to weight and space requirements. And since the reliability of an engine is practically a function of its weight per horsepower, airship engines have little to worry about on this score.

Cost and ease of maintenance are of relatively small importance in airship engines. Power plant cost is relative, and as airship working without cost absorb a much greater powerplant expense than an airplane-powered airship powerplant meets its primary requirements of maximum economy and maximum dur-

*Attention was dramatically called to the special problems of airship power plant design and construction by the misadventure of the Graf Zeppelin on her uncompleted Atlantic flight last spring, when the failure of four of the engines forced the ship to put hurriedly into port. The explanation of the trouble is here given in detail, it is believed for the first time. Commander Shoemaker also explains the special problems of airship power plant operation and their effect upon design.*

ability. Ease of maintenance is a function of durability. With durability at its highest possible point, maintenance problems vanish.

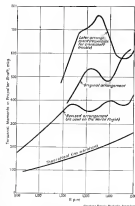
THE NATURE of the service in which airships will be operated sets the pace for the requirements as to durability and economy. Due to the fact that airships cannot be operated economically on short flights, their future seems to be in trans-oceanic or other long-distance transportation. If a trans-oceanic airship line is established, the operations schedule might well call for an outbound passage of 60 hours and a westward passage of 90 hours, with a 90-hour turnaround at each terminal. This amounts to 330 hours per round trip, or approximately one round trip every two weeks. Each round trip would involve 150 hours in the air, and the powerplant should be capable of at least twelve round trips (1,800 flying hours and 24 weeks' total time) between engine replacements with double the durability as a mark to attain.

One thing is clear of airship engine durability is the fact that it is almost never necessary to run the engines

*and a Explanation of Engines*

at full throttle. An airship lifts off the ground, whereas an airplane requires full power for take-off. And full throttle running is several times as hard on an engine as is part throttle operation. Hence if an airship engine is never run at full throttle (except in emergencies), the durability of the engine should be far superior to that of an engine which is required to operate at full throttle. The difference in working stresses between full and part throttle running is well illustrated in the operation of the Maybach engines of the Graf Zeppelin. These engines can deliver 600 hp. at 1,600 r.p.m. at sea level, and have no without adjustment for 400 hours at full throttle. In the Graf Zeppelin the normal engine speed is 1,400 r.p.m. at which speed the engines are delivering two-thirds of their maximum power, while the cylinder pressures are reduced to three-fourths of those encountered at full throttle. This reduced engine speed and pressure involves a great increase in engine durability.

First economy in an engine goes hand in hand with its effective thrust. In other words, low fuel consumption in an engine is no advantage unless accompanied



Stroke and moment in propeller shafts obtained without a run for the various arrangements of the coupling

by a high propeller efficiency. Fortunately for the case of the airship engine, the high thrust allowed to the engine weight and size enable the engine designer to provide a relatively low operating speed for the engine, with the addition, if necessary, of a durable reduction gearing

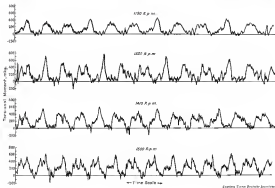


The Graf Zeppelin in the world-famous flight around the world

between engine and propeller. The airship being essentially a "big cage carrier," fuel economy becomes of paramount importance. An example may illustrate this. Suppose an airship engine weighs 4 lb. per hp. with a specific fuel consumption of 0.4 lb. per hp. per hour



Above: The forward gondola of the Graf Zeppelin. Below: The record of the torsional moment of various engine speeds.



and an airplane engine weighs 1.5 lb. per hp. with a specific fuel consumption of 0.5 lb. per hp. per hour. Then at the end of 25 hours' running the sums of the specific engine and fuel weights of the two engines will be equal  $((1.5 + (25 \times .50) = 40 + (25 \times .40))$ , and for longer flights than 25 hours the losses for more economical engine will large steadily stand.

The development of air-lap engines has been slow, owing to the fact that the fabrication of airships has lagged since the World War. The Graf Zeppelin is L.Z. 127, the R39th Zeppelin, and yet it is only the fourth Zeppelin constructed since the *Acronautica*. And the rest of the world has built not more than a half-dozen large rigid airships. The success of the Los Angeles (L.Z. 126) and the Graf Zeppelin (L.Z. 127) can be attributed in large part to German foresight in the development of airship powerplants. Realizing that improvements in airship engines must parallel those of the airships themselves, Goetz Zeppelin founded the Maybach Motor Works as a necessary part of the Zeppelin establishment. Today the Maybach VL-2 engine is the latest product of the Maybach Motorworks, is probably the outstanding airship engine of the world.

The Maybach engine contains remarkable durability in very careful design, combined with the liberal use of roller bearings throughout. Main and connecting rod bearings are roller bearings. Crankshafts are carefully balanced and reciprocating weights are balanced dynamically. Dr. Maybach has developed successful testing to a very high point. All castings for moving parts are tested for resistance to fatigue in an impact machine in which the test specimen is rotated through 90 deg. for every blow. Stresses in moving parts are very carefully



View: The new R39th RZP, second to be built at Goetz Zeppelin Co. factory, Berlin. One of the R39th engines of the RZP.

weighting. Working stresses are applied to finished parts, and the resulting strains in all sections of the piece under test are carefully measured. The fuel consumption of the Maybach engine is remarkably low for an Otto cycle engine, being about 20 per cent better than that of present-day airplane engines. This low fuel consumption is the result of the use of a high compression ratio (27-1), together with very careful manufacturing. The low friction horsepower of the VL-2 engine is also a contributing factor.

With this in the light of the failure of four out of five of the Graf Zeppelin powerplants, tests last spring, on the attempted east-to-west trans-Atlantic passage which terminated so ignominiously at Coco-Perillo, the Maybach engines would seem to have been completely redesigned and rebuilt before the commencement of the successful world flight. This whole situation has been shrouded in mystery, and the world has taken it for granted that the engines were faulty. The writer mentioned the facts in the case during his recent visit to Germany, and was given permission by Captain Lehmann of the Luftschiffbau Zeppelin to see these facts before the public.

The whole trouble lay with the flexible coupling interposed between the engine and the propeller. An originally developed by the Zeppelin Company—the flexible coupling contained spring pockets slid radially between two drums (one on the end of the crankshaft and one on the end of the propeller shaft). This original coupling was satisfactory, as evidenced by the successful trans-Atlantic round trip of the Graf Zeppelin last fall.

Subsequent to three flights the Zeppelin Company modified this coupling by changing the diameter of the springs from 3 mm to 4 mm and by taking out the small amount of play between the spring pockets and the drums. This modification was entirely responsible for the powerplant failure experienced on the following flight.



One can well imagine the consternation among the Zeppelin and Maybach engineers, and the probable mental recriminations, when the powerplant failure cropped up. Both the technical school at Stuttgart and the German scientific laboratories at Adolphshaus were asked on for advice and assistance. Dr. Kamm of D.V.L. at Adolphshaus was intrusted with solving the problem involved, and the writer had the privilege of discussing the whole problem with Dr. Kamm at Adolphshaus.

It seems that the spring coupling in its original form

caused resonance between the primary and secondary torsional vibrations from 1,480 to 1,580 r.p.m. When the coupling was stiffened by increasing the spring dampers and eliminating the play, the r.p.m. at resonance dropped to 1,300-1,400 r.p.m. The Graf Zeppelin started out last spring with the modified coupling installed, the engine running at 1,400 r.p.m., the normal cruising speed. After the first two engine failures the chief engineer altered the remaining engines to 1,325 r.p.m., still in the range of resonance. Two more engine failures resulted. When Dr. Koenig was called in from Affiliated to investigate the persistent failures of the Graf Zeppelin, he employed a modified vibration diagram in the determination of the torsional vibration resonance ranges as stated above. The new flexible coupling, as at present installed on the Graf Zeppelin, was also tested. This coupling has moved the range of resonance of the torsional vibrations down to around 1,200 r.p.m., which is well below the cruising range and will be forever avoided in the operation of the engines.

One of the principal problems in connection with the operation of airships has been the maintenance of airship weight and balance from the beginning to the end of a flight. The loss of weight during flight has been largely due to the consumption of fuel in the gas-lift engines used, and formerly required the sailing of



One of the 400 hp. Maybach engines in the W-1.  
Built at Los Angeles.

lifting gas to maintain the ship in equilibrium. It is desirable to avoid the sailing of lifting gas during flight in order to maintain the center of buoyancy of an airship at a given point, longitudinally and vertically, and hence keep the balance of the ship unchanged. In balloons-inflated airships there is an even stronger incentive for the conserving of lifting gas—namely, the high cost of the gas.

The problem of maintenance of airship weight was solved successfully in the United States Navy by the perfection of a water recovery apparatus. For every pound of gasoline burned in an engine there is nearly a pound and a half of water present in the exhaust. This water is present in the exhaust in the form of vapor and is captured by cooling the exhaust. The water

recovery apparatus has been successfully employed in the Shenandoah and the Los Angeles, and enough water can be condensed out of the exhaust to more than make up the weight of gasoline consumed. Two drawbacks to the use of water recovery are the accuracy for the use of alcohol in the recovered water to prevent freezing and the large increase in the drag of the airship with the addition of the water recovery apparatus in its present state of development.

THE GRIEVOUS cost (in the Graf Zeppelin) of gas fuel in place of gasoline, serves the same purpose in the water recovery apparatus in the Los Angeles. The fuel gas used on the Graf Zeppelin is approximately as heavy as air, so that as it is consumed the balance and weight of the airship is unaltered. The idea underlying the use of gas fuel by the Graf Zeppelin was not primarily that of conserving gas. The most important reason was the fact that there are more than 100 lbs. per gallon of gas fuel than in gasoline, so that the cruising range of the airship is greatly increased with no addition in weight.

The use of gas fuel in a hydrogen-filled ship such as the Graf Zeppelin adds nothing to the fire hazard. In the Los Angeles, however, where the lifting gas is helium, the use of gas fuel would create a fire hazard which is practically non-existent at present and which would disappear entirely with the advent of successful heavy-lift airship engines.

The huge airships now being built for the Navy by the Goodyear Zeppelin Corporation will incorporate a distinct change in powerplant installation. Instead of the usual "power pits" or engine nacelles situated below the envelope of the airship, the engines will all be housed inside the envelope. The propellers will be supported on struts built out from the framework of the ship and will be driven by line shafting. It is needless to state that the transmission problems involved in such an arrangement are rather complex.

The first of the new Navy airships will be powered with Maybach V-12 engines. Since at once demands any uncertainty regarding engine characteristics and performance, and permits all of the preproject design work to be concentrated in the transmission problems. Water recovery will be used on the American airships and it is expected that the greatest increase in drag caused by the use of the present form of water recovery apparatus will be eliminated by a new design of exhaust collector.

In the effort to develop the best type of airship engine the Navy has turned to the compression-ignition heavy oil engine as the airship powerplant of the future. The compression-ignition engine (commonly called the Diesel) has inherently low fuel consumption, and it is hoped that the engine deficiencies encountered in engines of this type in the past will soon disappear. The compression-ignition engine offers the advantages of reduction of fire hazard, improved fuel economy, elimination of the radio interference inevitable with high tension electric ignition, and reduction in fuel tankage due to the greater wet weight of fuel. The last present-day compression-ignition has the disadvantages of high engine weight and lower durability over comparable gasoline engines. These disadvantages are being overcome, and it is hoped that the next year or two will see the completion of at least one compression-ignition airship engine which fully justifies the time and money spent on its development.

# THE Human Factor IN FLYING

By J. B. CULEMAN

*Errors in judgment have, according to official report, been responsible for a large proportion of airplane accidents. Nothing could more emphatically point out the necessity of "developing" the human factor if maximum safety in flying is to be achieved. Mr. Coleman deals in a most interesting and informative way with the human factor, its idiosyncrasies and its tendencies. Of particular interest are his ideas regarding the work of the flying instructor, and of how his task should be accomplished for maximum benefit and only to the student but to the future of aviation in general.*

term of mind coupled with a widespread interest in the human material he deals with, will soon give him a valuable insight into various aspects and their possibilities. The instructor is in a position of authority through the knowledge he has acquired. His mind and will, his ears and eyes, his nerves and muscles, his ability to concentrate and learn and, lastly, his practical, unhesitant, and resolute concentration to his wishes and the needs of every situation. All this he must transfer to his pupils. They must acquire it and then put it into practice and it becomes second nature.

Educational psychologists have discussed this transfer of knowledge in many viewpoints. The details of the transferring need not arrest us here. The fundamental fact that we provide our education in all languages and in all sciences and help to most effectively the unexpected problems the new and complex situations arising as a later development. At the same time it is true that no amount of special training can possibly prepare for every type of emergency in life, or more specifically in flying.

It is our faith that, when we impart, we "carry over" and help to most effectively the unexpected problems the new and complex situations arising as a later development. At the same time it is true that no amount of special training can possibly prepare for every type of emergency in life, or more specifically in flying.

A study of this human factor involves psychological processes that need to be understood in training days, and to be modified, perhaps in later years. The instructor has the student under close observation for words or moods. He is far better qualified to form a comprehensive judgment, and to help ward off undesirable, than the official examiner of the Department of Commerce, who puts the pilot through the prescribed evidences in an hour's time. The bearing of a pilot as the level showing of his test is not necessarily an infallible guarantee of competence under all conditions because of the ever-present personal factor, manifestations of which may not crop out during this short period.

Students come in their own kind, sometimes with an open mind, eager and amenable; sometimes with a restless overwrought attitude, that wants under repeated corrections. Each has an individual makeup. An instructor's experienced eye will quickly detect harmless idiosyncrasies, or dangerous tendencies. An analyzed

Two points are of interest here: the contents of the student's training course with a view to an intrinsic value, and the method by which he is taught this content. Since it is impossible to accept every stage of value in the course, a judicious selection must be made, and some subject matter must be rejected on the basis of relative value. But, the correct procedure, or the correct method of training becomes all the more important, in order that the subject matter should be effective in transferring desirable habits, skills and ideas, that must become fractional later on when the new pilot is on his own. Among the better class of flying schools there is a distinct tendency towards standardization, beginning with complete standardization and high class equipment. While the expense is in proportion, the results achieved, and more stringent regulations will gradually bring about the elimination of inferior and dangerous schools.

The instructor needs to be the highest all-round type

of man and pilot, who looks not so much for quick results as for permanent results. He will not run any unnecessary hazards and make every possible provision against failure. He should be offered every incentive to make his work as pleasant as he is expected to make it effective.

Educational psychologists suggest three interlocking ways in which he transfers his education to others. They are: create identical factors, identical factors, and identical factors. Or, in more familiar terms, through the mind, the will, and the memory, trained to fare and together, he fulfills any pilot's

"IDENTICAL FACTORS" include a thorough understanding of every part of plane and engine, its functions, and the reasons why it functions correctly or wrongly. Identical factors lay the foundation for the factors to build upon. They need to be stressed very much, singly and in their interrelation. From an endless array of examples, just one may be added as an illustration. The possibility of a stall is a hazard to every pilot, in every aircraft, in every landing. It need be emphasized as in various causes, consequences and remedies. As these are drilled into the student's mind, some one detail may be credited out by others that gain temporary supremacy only gradually will different ones become assimilated by the mind into a consistent whole. The training of the mind is dependent upon, and goes along with the training of eye and ear, and to some extent of the general muscular system. They act in one with the mind as, for instance, in the judgment of speed, or distance. The one preparation for the operator to guard against it, is to take for granted that, what is familiar, simple and true to him, is therefore equally transferable to the pupil.

The mind may become so thoroughly absorbed in the activity as to leave no room for "unusual" factors to get in their operative work. A slight wobble reaction is fatal. Quick coordination of will and mind is essential. The will, in turn, reacts on the muscles, insuring them to effect the correct bodily motions of arms and legs. This coordination again must become as perfect as to terms of the mind, under the training of the senses. Time for reflection and deliberation is seldom at the pilot's disposal, less of all in an emergency. In that case the will is also called upon to dominate and suppress fear that wraps judgment, prevents clear thinking and acting and leads to a serious accident. It may well be as well to state the fact that in the direct result of clear judgment, and decisions from taking unnecessary chances a strong will should stand firm against all tending and flying trials.

The accumulated experience of mind and skill interplay, is moved in the memory against future requirements. "Attention factors" therefore are called upon to ascertain and apply whatever lies present in the depths of consciousness. Association of ideas plays a large part in raising dormant powers, at, and when they are needed. A quick and adequate response to a stimulus, such as a pilot or a factor part of work is a guarantee that the mind, the will, and the human mechanism function together in reliable manner to meet unexpected demands. In the long run all three factors must merge into one and operate as a unit. The failure of one of them is a critical moment, generally spells disaster.

The more or less random directing of the various psychological factors at work in training may seem far-fetched. Yet they are at work, if unconsciously, in every individual. The better they are understood and delin-

ately used upon, step by step, the more thorough the result will be.

The instructor transfers his knowledge to the pupil, the latter is judged to have acquired habits, skills and ideas which he must successfully make functional on his own account. A pilot's "feel of the plane" should enable him to run it while his mind is presently busy with other problems, such as charting his course, checking his instruments, or receiving communications over the radio. To this extent habit and skill are a true test of intelligence or knowledge.

But it should be borne in mind that habit is not always and necessarily a test of present intelligence. A number of examples may be named to exclude certain misinterpretations with scantifiable precision, that is fairly a test of the mind's intelligence, but rather of the trainer's intelligence. For the actual is easily trapped and does not always result in changing circumstances. A real measure of knowledge involves the occasion and the application of ideas to new problems, new conditions, new emergencies, in such a manner that man can deal with them instantly and effectively. To the pilot this fact is of extreme importance since it is of such frequent occurrence. He is constantly called upon to check or adjust or change his habitual mind at will. Experiments and rehearsal set up to the test in entering the new situation or the new combination of an emergency. In such cases automatic habits may clash with one another and lead to disaster. Or, they may co-operate with one another under the direction of an active mind and save a desperate situation. The quick transfer of habitual knowledge to actual operation distinguishes the good pilot from the poor one. The pilotage type who flies by rote of thumb, is likely to detect the danger and to attempt a correction when it is too late. The high-sounding, extensible type is likely under the stress of the moment, to space carefully built-up habits, and by uncontrolled defeat to lose purpose.

STERLING BAYNARD and forecasting it, whether it be in connection with the plane, the weather, the terrain or the public, is a psychological factor. The pilot must be a thinker. Psychology is still the best part of value. The commercial pilot who is to insure confidence and win the difficult business for an airline as a large scale must inspire upon himself the utmost confidence, and represent the airline to the public and the business world. It is of the very of his own mind. Whether some individual pilot may think they do not win prospective passengers to trust themselves on board to the airplane as a regular vehicle of transportation. And it is the general reaction of the public that counts in the long run, or otherwise as in any other business.

Psychology has come to play a large part in the business world. Age and experience have won recognition for the great business executive, for the captain of liner or battleship, for the commanding general. Age has given them the benefit of a long trial and error experience resulting in the balance of judgment which is their greatest asset.

Youth and experience are required in a pilot. Youth is an asset, in his case, that is well worth independent. It also has drawbacks that are as undeniable as they are occasionally highly brushed over. These, psychology, can help him realize to a large extent if he can be convinced that a trial and error experience is more final to him and to the cause he represents, than to any business or to any expense.

## MAKING Airlines PAY THEIR WAY



Passengers waiting to board the tail of the Great Central Air Train, Los Angeles.

AIR TRANSPORTATION is a manufactured product with definitely measurable costs and values. The airplane is a broad base, is the machinery that creates it. In any manufacturing operation, if the plant is worked only 2 hours a day the operation cost approximates a four-fold increase in the investment. Airplanes carrying passengers along American airways only one-fourth of each working day must earn returns on 400 per cent of the actual investment during their periods of operation. The air transportation industry is the United States' most wasteful enterprise with vehicles of licensed carrying capacity at rates considerably higher than ground vehicles charge.

European air lines stand in a favorable position. Most of them receive government subsidies. The western airlines, in contrast, for continental air lines to offer transportation at rates which in some instances are below the rail level. Stagnant, in short, permits a tariff which streets are travel. Funds derived through taxation make up its deficits. The only justification for

such an arrangement of which I know is the cause of military necessity. There is no sound economic reason.

No airplane in the world can be flown profitably at less than full rates. Where in Europe airplanes are loaded on to a large scale as reserve air material in which the government should have a direct interest, in the United States, their development is considered primarily a business problem. The two situations may be explained on that basis.

American air line tariffs cannot hope to compete with surface rates. In some instances, however, operators can lower tariffs to induce larger numbers of people to travel. While many airline operators consider the present high tariffs lower than costs justify, higher rates would have the effect of driving away business. As volume increases and use of airplanes more nearly approaches its capacity, costs and charges naturally will scale downward. But how can that necessary volume be attained?

THERE are two views of the public's attitude. One holds that the American public are only aviation conscious, not air-minded. The other declares that people are air-minded and will ride in airplanes whenever they wish rates justify air travel.

Our experience in building the Federal Express System in 15 years from a one-man, one-car line operating 35 miles over a dusty road between San Diego and Imperial, Calif., to an intricate operating 400 lines and motor coaches throughout the west, points to the logic of the lower fare view.

People want service, whether it be a speedy shoe store or early delivery of a newspaper. They want things seen-



Traveling passengers from a Flaklok line in a Flaklok plane of the West.

In their travel they want to reach a depot with maximum time and trouble, ride to their destination rapidly and comfortably and be deposited at their office or home without any delay. This is the wish of the individual who has data in perfum, whose time counts. That being the case what does he demand in his transportation? Fast and frequent service at low rates?

Air transportation provides both comfort and speed. One may reach 300 miles in a morning through the air as conveniently as a parlor car. Not in a private car yacht, but in public carriers. His only investment is the outlay for a ticket entailing him to transportation between two points. In most types of places he may realize easily in a continuous short enjoyment with an adjustable table. In all he may read or write or sleep, calmly at ease and with no discomforts. But the so-called "average people" will not patronize our lines heavily until data indicate them so to do as indispensable to the country's well-being. How, then, can this be achieved?

**I**N OUR OPERATIONS we have reached to a superior conclusion. One must be kept low through working equipment as much as possible without sacrificing dependability, and the latter in themselves must attract persons who otherwise would not be traveling. In other words, equipment use airplanes not because of the lower flying but because of the economy of time.

On one of our lines where another company was operating one plane a day, we inaugurated a three-plane-a-day schedule with four one-day lines. We tripled the service and about the time 35 per cent. Public response came immediately. Not because our planes were better. Not because our pilots flew a rule or as fast or most of the reason partly to new scene benefits. Not because our surface equipment was better, for we use the same air terminals.

Passenger rates have not yet been worked out on any logical basis. They generally are measured. Most lines in figuring their potential business take a 100 per cent load as the basis of calculation. No business attempts to gauge. Airline executives should recognize that fact. Some of the best airlines have based their fares on the basis of 40 per cent loads representing the average load. As a matter of fact, few have carried that average over a period of months. The air mail has averaged about 60 per cent, which might fairly be taken as the present maximum average. This result not apply to passenger carrying planes, however.

If 40 per cent loads will pay the costs profits will accrue somewhere between 40 and 60. When the average is 60 per cent loads use 100 (a full plane) will permit the use of an additional equipment in a profit. It is under these conditions that our transportation will bring into its full stride.

Airline operators desire to lower their tariffs to meet needs, but our primary trouble has been the non-acceptance of air traffic facilities. Airline operators are not accepting people who either have no transportation background or who have a background of only one mode of transportation. No two modes of travel have the same economy. The airplane portion of the means of the ocean vessel but function in the territory of land transportation. It contributes to the economy in a whole vehicle and approximates the same loss in an service.

We have not yet reached the point where selling air transportation becomes a fairly simple over-the-counter transaction. All large companies sell not only to get

people into their planes for the first time, but to take every step within their knowledge to "sell" their one-time passenger, and thus build up a large clientele.

Methods other than mere inducements suggested by the various companies to get people into their planes the first time vary only in detail. All advertise in newspapers, all send personal representatives into the field of make use of "tag people" to demonstrate to the rank and file that air travel is a habit with the "best people," all use varying methods to get the public to visit airports and acquaint themselves with planes and service.

The passenger's first impression governs his future feeling toward the company. Any little act of courtesy which helps build up a friendship on the part of the passengers will come from every act. A common selling factor became the first fast line of advice and by their acts the success or failure of an air transport company may be fairly well predicted. We make the same requirements of all field attendants, especially in seating the public and their assistants, that are required on the selling floor. Every employee of the average is a potential salesman of service. Salesmanship comes through every act, both on the ground and in the air.

In the airplane itself most of the "in-selling" is done. One who has a plane having had a pleasant trip does look for more, but the passenger who experiences some unpleasantness may never want to go up again. For that reason our pilots are instructed to do everything they can to make trips more pleasant.

Two factors make for extra business more than any other. One is the plane and the feeling by the passenger that he will be taken up in a suitable plane carried in level flight without any suggestion of turbulence, rising and set down as his destination on time or ahead of schedule.

I was pleased, recently, to note the well-equipped public interest in air travel. While this may or may not be made manifest by entrance use of airports at present, public interest gradually will find expression in travel and not merely general interest with knowledge and equipment. We noted the many first-time 10,000 fliers who, during our routes and quoting prices were prompted for distribution to agents. We had thought the supply ample to cover distribution over a period of six or eight weeks. In exactly nine weeks the supply had become exhausted. And in the first eight weeks approximately 40,000 had been distributed.

We continue to print in excess of 10,000 only because schedules and tariffs are subject to such changes that information printed on a week's time might be obsolete the next day. These weeklies are distributed immediately but go only to those who take the trouble to request them or take them from racks.

These racks and ticket offices are scattered over the Pacific Coast in scores of cities. They are maintained by the Pacific Coast representative, the largest air transportation organization in the world. Agents receive both the bus and the airlines opportunities. We thus have the widest spread air transportation selling organization in existence.

**F**EARLESS AGENTS are in a small traveling town to the chief pilot, all are schooled in the thought that if breaking a rule will make a friend, the rule is made to be broken. This applies of course to rules the breaking of which will not impede the journey, or endanger life or equipment. Frequently a fractured minor rule causes the company



Delivery time of a Pickwick ticket often limited by time taken to get agents.

so inconvenience and then a warm friend for Pickwick. The representative is individual conscious rather than corporate consciousness.

Discreet passenger agents represent both the airports and the agents system. The airports is realized through them, and other employees to take advantage of a large traffic organization to get business for the airports. Airlines tickets may be purchased in any office or travel bureau where Pickwick tickets are sold. The feature of having a large personnel already familiar with needs of travelers in providing a great asset to the air company and enables us to widen our scope of operations rapidly and easily.

We have nearly 2500 offices available for supplying information on air travel and for sale of tickets. Many of these are located along routes which undoubtedly will become scenes of tremendous air traffic and will serve as an excellent background of an air travel organization.

An individual to sell transportation must not only know the transportation he sells and its advantages, but he must also be something of a psychologist. Our disinterested passengers are not only good customers but they also have distinct abilities to reach others to sell. Our ticket agents where they pass only after having graduated from our transportation school where they learn the "behind the scenes" angles of the business. Then they come to understand in what ways they can facilitate an individual's travel and make him more comfortable during a journey.

We have been convinced, since the time when Pickwick Airways was only an idea, that low fares coupled with frequent and fast service would draw passengers into our planes. This conclusion was predicated on our own experience in selling bus transportation. At the outset we sold passenger tickets for transportation only, at as low cost as reasonable. On this no baggage was permitted. This followed the European idea. Those

who wished to carry baggage could do so at a charge approximating a very light baggage.

This arrangement, it was thought, would not prevent the individual from carrying a little extra baggage for the person carrying heavy baggage. The plan later on solved some difficulties, however, and we now have abandoned the arrangement. Now we permit each traveler to carry 25 lb. of baggage without charge, excess to be carried at the full air rate.

Low fares and frequent service, I have indicated, promised to bring customers to the ticket office. We attempt to apply the general experience acquired by 17 years of handling traffic to develop the air service. As a result our air service has been increased somewhat three-fold and fares reduced approximately 35 per cent. Publication of this information brought an immediate and favorable reaction.

Some aerial traffic engineers hold to the theory that economically business in volume must be developed at prevailing high rates before firms can be formed. We maintain that having been formed and frequent service at low fares the public will respond with a volume of business sufficient to justify early low fares.

Where will increased volume of business lead? To more frequent and faster service or to larger planes?

Our content for the future is to build up the business of air transportation, like a sailing steamship, will pack up many manifestations (perhaps some extensions) as it gathers momentum. 2 means to say, however, in agreement with others in the industry, that for larger lines planes must be larger than those now being used. It will be built that for shorter runs where the average peak loads are lighter, smaller faster planes of a distinct type will be developed.

**A**CTHIN I HAVE MENTIONED is our experience in developing the single system. At the airport we used four small, open seven-passenger cars. In a short time the passenger capacity had grown to 7, 9, 12, 14, 25 and now to 44 passengers per unit. Manifestly the larger buses run on larger cars. For shorter lands smaller vehicles are used.

The situations are relatively parallel. Rapidly, we are coming to larger and faster planes. At the outset, something over a year ago planes with a cruising speed of 100 m.p.h. were considered adequate. We now know that such speeds are insufficient. On the Los Angeles San Francisco run over which some major lines operating all maintain an express schedule of 5 hours. The distance is 225 or 24 hours. Next year they may be covering the line in 24 hours.

Passengers are not so anxious to reach a destination ahead of time as they are to be on schedule. They are presently fed that if they carry them in too far ahead of the appointed hour, on some other day they may be as far behind their schedule. For this reason, while we permit plans to go a little ahead of schedule, we for being there at such a rate per hour that all planes have reasonable reserve to meet the schedule even in the face of head winds. With this reserve they can fly around fog or rain or through the clouds.

What the public wants above all else is comfort and dependability in the air. If a traveler can be convinced that these conditions are the above mentioned, he will come back for more. It is the problem of the traffic department to "sell" the passenger on these points. Increased business will come without further effort and without pain.

# PIRATING of Trained Personnel

*A Cross Section of Governmental and Commercial Aeronautic  
Important Subject as Presented Editorially in*

*Opinion Regarding This All  
AVIATION*

**R**EFRESHING the reader's memory, the editorial suggestion was that the industry enter into a government's agreement to protect the skills of the Government aeronautical services and bureaus and of universities by refraining from approaching with a mere to employment, any of their employees of less than two or three years standing. There was no suggestion of commencing restrictions upon the natural freedom of the individual to seek employment wherever he might wish.

Speakers for those in agreement with such a pledge, we quote the following excerpts:

**R. F. Cusick, Chief Labor Aircraft Corporation:** "I am in entire accord with the thought expressed."

**R. H. Platt, President Consolidated Aircraft Corporation:** "My specific answers to the three questions in your letter and editorial are 'Yes' to each."

**R. B. Samuels Jr., President Cessna-Air, Inc.:** "Your suggestion, readily is, of course, the only possible, practical one."

**Har. Short, President Stratton Aircraft:** "It would not only be to the interests of the industry to eliminate the poaching of personnel from Government aeronautic activities, but if the present conditions continue to prevail it would be to the end of destroying the fine service these departments are giving the industry."

**C. Roy King, Vice-President Curtiss Aeroplane and Motor Co.:** "I do believe it is to the interest of the industry as a whole not to divert personnel from the important governmental bureaus and certainly not to siphon the services of any individual without first ascertaining the attitude of his employers."

**Mr. R. Stone, Stone Air Services:** "I agree with you as to the problem of poaching government departments and that it is to the interest of the industry to prevent making of the personnel of these departments."

**Temple N. Joyce, Refinery-Joyce Aircraft Corporation:** "I seriously do think it would be to the best interest of the industry to find a means to prevent the wholesale raiding of personnel from the government, particularly the National Advisory Committee for Aeronautics, as their research work is invaluable."

**J. C. Hunsaker, Vice-President Goodyear-Zeppelin Corporation:** "A well-known speaker: 'The Goodyear-Zeppelin Corporation is in sympathy with the spirit of your proposal; however, the pledge suggested will hardly be effective in checking the natural flow into industry of young scientists who have seen of an apprenticeship in government or academic work at low salaries in order to gain experience and training."

**Ivan H. Dwyer, Dwyer Aircraft Corp.:** "I agree with you entirely in the ideas you have expressed and will be willing to state that our organization will not seek to employ any individual who is necessary to any of the Civilian or Research Laboratories for the purpose of carrying out their functions."

**Chas. F. Cream, Cream Aircraft:** "Though it is true that the industry is lacking the technical staffs of the Government Bureau after all, their men are still in aviation and the greatest good might come from the present policy if these men would get out into the field and come into contact with the actual work going on and while it seems desirable to take these men out of the governmental departments there is no reason why they should not return to this service after rendering good service to the industry."

**A**ccompanying to "lost doves" the atmosphere of animosity in connection with what has been described as "a natural interchange and flow between the government and industry" is apparent in the following quotations from officials of the "Loh Wing":

**F. R. Rosenthal, President Pratt and Whitney Aircraft Co.:** "I believe that most of these problems will

adjust themselves in a perfectly natural and normal way so we go along and that there is little that artificial legislation can accomplish."

**Charles L. Lawrence, Vice-President Curtiss-Wright Corporation:** "I agree that the government is much hampered by the loss of experienced men who go into commercial jobs. However, I do not see how this can be prevented. To prevent this opportunity for advancement would be unfair to these men in the Department and would have an effect upon the quality of the men, as the chance for better opportunity would be lacking and the people the Department would be able to hire would be of inferior quality. The only way I see that our government then having as they get more experienced, would be then getting better salaries than are at present available."

**Richard B. Dwyer, Jr., Sales Engineer Fairchild Airplane Mfg. Co.:** "The industry generally recognizes the very great importance of the research and development work being carried on by the various government aeronautical branches. Nevertheless, I do not know of any feasible means for preventing a more or less continuous draining of personnel from the government departments by commercial companies. In a majority of cases it is not the commercial companies who take the personnel out of government departments, but rather a desire on the part of this personnel to eventually secure connection with commercial concerns. . . . Almost all of them recognize the fact that the financial outlook is bound to be higher in the industry than in any government department. . . . There will always be an influx of younger workers into the government positions where they will receive valuable training and experience and gradually fill up the gaps left by the older men."

Quoting a verbal arrangement between the Curtiss Flying Services and the Department of Commerce which provides that the former company will not approach a government expert until he has served for at least a year, C. S. Jones, Curtiss president, states, "I think that there is a certain type of personnel which is certainly difficult

*Is commercial aviation robbing the Government services, universities and important research bureaus of their trained personnel? If so, is such action for the ultimate good of aviation? Granting the oft-made charge is true, what is the solution? These questions implied and answered editorially in our issue of November 2, pp. 872-74, evoked a full measure of controversy from both sides of the fence. Of over 50 responses received in answer to AVIATION's solicitation, slightly more than half express a willingness to maintain the "hands-off" policy recommended in the editorial, though several of the detractors modify their attitudes variously; a relatively small number incline in the opposite direction or feel that the problem will solve itself through the "shrink-and-down" process; an even dozen offer substitute solutions, and one frankly admits that he is on the fence and wishes to remain there.*

to replace and unless it is hoped that their association with the industry is such that their productivity is increased rather than decreased (in their own connection) the taking of men from their present concerns, say, in the course of the next few years, actually handicap the advancement of the industry as a whole."

**C. T. Porter, Executive Aircraft Corporation:** "We sympathize with the present situation of the government agencies and feel that the manufacturing companies are seriously handicapped by the lack of trained personnel, nevertheless, we believe that any attempt to regulate the flow of supply and demand or to interfere with young men in their rights to enter into concerns tending to the betterment of their financial position would probably be unfortunate and might even act as a bottleneck, discouraging action from entering the government service."

**L. M. Haddock, Aeronautical and Research Engineer Perkin-Elmer Co.:** "The temporary removal measures such as you indicate may be highly desirable at the present time, but I believe that ultimately the position will be solved through the two different types of organizations attempting to attract those men who are inherently suited to the different requirements in these separate spheres."

**"Y**et a declaration is in accordance with common business ethics, . . . but I am very doubtful that the government, even though it were agreed to by all the man-









## Meet to Arrange '30 National Tour

*Entirely New Formats  
Probable for Next Year*

**DETROIT (UPI)—An** informal meeting between National Air Tour officials and representatives of manufacturers for the purpose of discussing the problems of the 1955 National Air Tour was held at the Detroit Athletic Club, Tuesday evening, Dec. 1. The meeting, called by Capt. Ray Collins, manager of the event, was presided over by William B. May, chief engineer of the Ford Motor Company, and chairman of the Tour Committee.

Although details of the discussion were not disclosed for publication, a Senate Committee of five men was appointed by Mr. Mayo, and will employ a number of men to study the situation in the proposed 1950 Tour route and the animals which in turn, will be submitted directly to the manufacturers for their criticism. It is probable that some of the manufacturers will be asked to place of the one group in use. It also is likely that the Tour route will be dropped to take in the smaller states in preference to the larger countries having the Tour of the Americas. The exact outcome of the study is not known, but the Commission is favorable toward routing the 1950 tour to visit both Canada and Mexico, with the hope of stimulating the market in these countries for the products of the United States. The tour manager is composed of Arthur G. Scholander and R. P. Crocker, managers of two Texas Cattle Co., St. Paul, Minn., and the American Cattle Co., Texas. The tour will be managed by the American Cattle Co., Texas. The tour will be managed by the American Cattle Co., Texas.

## Three WPs: 450000

[illegible]

### Labor Head Wants Air Patrol

WASHINGTON (A. P.)—Secretary of Labor Davis has recommended to Congress the forming of an air patrol to combat immigration smugglers and others who participate in illegal border traffic by plane.















## WHAT OUR Readers Say

### An Answer to Dr. Thaler

To the Editor:

The most important criticism which may be brought against Dr. Thaler's comments, which we have appreciated very much, is that they are irrelevant.

I. We require a practical method of solution. Dr. Thaler does not satisfy by a discussion on the type of material problem he deals with specific cases.

2. We do not doubt that in reducing the number of unknowns one simplifies the problem. Our purpose was not to avoid several particular cases but, on the contrary, the most general case with a conclusion for it is always possible to derive a particular solution from the general problem for each particular case. However, the very statement of unknowns has led little to do with our subject.

3. That in certain cases a certain number of unknowns is sufficient to exhaust for rigidity is not at all the object of our paper, where we are trying to find their stresses in any case that might be brought to the attention of the engineer.

4. The problem is a problem of strength of materials but does not consist of finding the optimum structure.

5. It is unnecessary to state and to state (the number of members) assumed not less than 1 or 2 according to the case, nor equations with the addition of the problem just as well.

Conclusion we have treated the two members case contained in Dr. Thaler's letter.

6. It is not our opinion that "in all cases" it will be sufficient to find three unknowns first, when the rigidity of the spars decreases toward the top.

If the spars are strengthened and have smaller areas, and if the spar is short, one may suffice. Or, if the spars are relatively light and if three relative inertia efforts greatly, and if the spar is very long, a much greater number of members may be required.

Nevertheless it does not seem possible to only one one solution, at the outer end of the spar, because this would necessitate such strong ribs at the base of the spar.

7. It is true that, from a theoretical standpoint, the theoretical difference of effect at the spar base on the rigidity of the wing structure. This static case and the difference have been shown in our paper, which we are sure that it could be replaced in the presence of more important factors.

Furthermore, it should be pointed

out that from a practical point of view, it is generally very hard or impossible to measure exactly the torsional strength of the spars themselves on account of irregularity of shape and also because of several different materials are used.

We have assumed that  $Q = 0$  as an elasticity optimum because it entails less negligible error and the practical solution became more simple, that is, more practical and useful for the average engineer.

The strength of materials is not an exact science. Every structural problem contains indeterminable factors such as lack of homogeneity of the material, combination of materials, efficiency of joints, of glued joints, etc. As engineers have to make which are mostly based on experience and tests and are therefore reliable.

The problem of the engineer is mostly practical.

7. We are sorry that we do not agree with Dr. Thaler when he says that "a statically indeterminate system becomes determinate when freed on a very long beam. This statement is reasonable, for the base being infinite has rigid, we do not believe that it would be safe to depend upon an assumption in a method involving the elasticity.

JOHN PETERSON and  
JAMES TAYLOR,  
Author *Aircraft Craft*  
Wichita Heights, N. Y.

### Real Words and Slang

To the Editor:

Referring to the letter in *Aviation* under "What Your Reader Says," Act

AVIATION  
December 18, 1939

tion and the Dictionary." November last from the Editor, Frank & Maynard, New South Wales, Australia, is very important that in the new edition which is going to press, particular care should be given to real words as distinct from the number of slang terms which have obtained an official stamp in the industry.

During the last few years it has become somewhat difficult to realize the exact meaning of some of these words. The SCA's report on technical vocabulary should form a good basis to work upon.

I would take this opportunity of referring to a word which I coined more than 20 years ago, namely *snatch*, which as an adjective is of colloquial and might be worth official consideration.

CARL ROBERT W. A. BOWEN,  
Airframe Engineer in Charge  
Development Corp.  
Johnston, Pa.

### Cryptic Colloquialisms

To the Editor:

The article "What of the 1930 Machine Age?" in your issue of November 25 points out many problems associated with the use, but, in my judgment one of the most pressing problems to most people who read about the war, is to understand the expressions, "snafu" and "snatch."

I try to find information on colloquialisms but must confess that, though I have a few ideas as to what these terms must mean, I am not at all sure my ideas are correct and have never anybody who could tell me for sure.

I cannot think of anything these terms can mean that cannot be better described otherwise.

Since the industry is so highly technical, information on colloquialisms between "aviation" and "military" and aviation slang new words as "topical" and "military" will be of interest that "snafu" and "snatch" give way to terms one can understand.

HAROLD K. LING,  
Pittsburgh, Pa.

## Editorial Comment FROM THE DAILY PRESS

### A Commerce Opportunity

REVELATION of air-mail lines to the west coast of Mexico and to the east coast of South America, now being considered in Washington, might, to the benefit of the American commerce in these regions, constitute as good a way as any. It has been estimated that \$2,000,000 is served

in the budget for the next fiscal year will be sufficient to get such service under way, and it would be difficult to spend a smaller amount of money, and get some benefit from it in any other way.

The United States should act before the service is furnished by somebody else and before others reap the benefit of the pioneering efforts already made

AVIATION  
December 18, 1939

by American in these lines. Delay again gives some other nation a start this would be difficult to overcome. As mentioned in the letter, it is a rather and unsteady delivery in the business will be more successful, important and more profitable. The use of light merchandise is a mistake.

Such shipping rates will show a trend that can be followed by other traffic both by sea and by land and, for several years, they seemed to be a serious situation that could not be avoided. It is justified. — LOS ANGELES TIMES

### Second-Hand Plans

A NUMBER OF AIR INDUSTRY MAGAZINES reports that airplane dealers are beginning to be equipped with more money which has been hoarding automobile dealers at recent years. High pressure sales of vehicles has caused a lot of money to be used cars and airplanes. Drawing the old plane people the article says.

Where a new car is not necessary to take a used car but use it as a new plane sales, the ratio has been used southern California. Dealers are acquiring used planes in fully half of their new plane transactions.

Since the airplane is following the

automobile in many respects it is logical to assume that somewhat the same methods of merchandising will be employed. That is, in a very short time, an old plane will have to be taken in as practically every sale of a new one. This development will cause the problem of disposing of the old planes.

The dealer who is not financially able to carry himself with a second-hand plane will be handicapped. Old cars can be disposed of with little or no expense. These old cars are not a serious problem because, if they have different bodies and lighting systems. In the same time the old plane is a serious problem. It is a problem on the ground and other planes. In fact, a second-hand plane is more than a headache. It should be disposed of as quickly.

The department of commerce, through its regulatory, can keep used planes which have been returned to most department standards from interstate sale. But it is not sufficient to do this. The department within the state. As a result it is up to the state themselves to do the things of the state. Each state has to take in the state government, especially effective system is needed. Secondly, one of the progressive states which have provided regulations which take care of this situation. — NEWARK, N.J. JOURNAL.

## New Volumes FOR THE SHELVES

### Aviation Engines

WILSON, ANTHONY, ENGINEER—*By*  
Pilot's Air, *Two Volume 1-2*  
Pilot's, *Aviation*, Volume 1, *Aviation*,  
Publishing Co., Price \$5.00

THERE ARE MANY ways of writing a technical book. Mr. Page's method has always been to make a large collection of chapters from miscellaneous sources, to make an object, and periodically bring them together for publication. This method, while seldom useful as a study book, is excellent when the material is properly selected and logically arranged.

I approached the task of reviewing these two formidable volumes with the hope that I should find an intelligent selection and arrangement. My hope was completely shattered. These two volumes are replete with errors and misstatements, and the arrangement is such as to bewilder anyone with an ordinary sense of logical order.

In Mr. Page's note to each volume we are constantly taken to the question of "Modern Aviation Topics," he has included much obsolete and ac-

curacy, and the really useful and valuable information which the book contains is sometimes difficult to find. This coupled with the illogical arrangement of the material, makes these volumes one of considerable magnitude.

Nevertheless, Mr. Page admits in his "Preface" that "Acknowledgment" that he has borrowed freely from the literature, and perhaps credit is his. However, the book is not a good one. Throughout the book he names his authorities in most cases although there are some omissions in this regard.

Some of Mr. Page's preliminary remarks are rather naive. For instance, the following sentence: "Every effort has been made in every paragraph, both sides of these pages to present a complete picture. The reader must select the line of reasoning that best applies to the case under consideration, and make his own selection." This is not a good idea. The reader must select the line of reasoning that best applies to the case under consideration, and make his own selection. This is not a good idea. The reader must select the line of reasoning that best applies to the case under consideration, and make his own selection.

In Mr. Page's note to each volume we are constantly taken to the question of "Modern Aviation Topics," he has included much obsolete and ac-

curacy in the normal gasoline-air mixture from a 100 per cent excess of air over the theoretically correct mixture, which may lead the reader to believe that the page is on a line of about 12 per cent excess air beyond which engine efficiency would be seriously affected. It is not difficult to find contrary information of the sort on many other subjects.

Another statement in the bibliography section is to the effect that the book is prepared especially for pilots. This may lead the reader to believe that the book is a technical book and that only such theoretical considerations of thermodynamics as are included in the book are of any use to the pilot. A proper understanding of engine action (other controlling factors) is essential to the pilot. This is not a book for pilots to read.

The department of commerce, through its regulatory, can keep used planes which have been returned to most department standards from interstate sale. But it is not sufficient to do this. The department within the state. As a result it is up to the state themselves to do the things of the state. Each state has to take in the state government, especially effective system is needed. Secondly, one of the progressive states which have provided regulations which take care of this situation. — NEWARK, N.J. JOURNAL.

Examples have already been given of the way in which the material is presented. The material is presented in a way that is not only confusing but also misleading. The material is presented in a way that is not only confusing but also misleading. The material is presented in a way that is not only confusing but also misleading.

The chief error in the present title of the book is again the inclusion of so much irrelevant material that it is very difficult for the reader to select the material that is of any use to him. The reader is left with a book that is not only confusing but also misleading.

The second volume is largely a collection of reprints from miscellaneous sources. The material is presented in a way that is not only confusing but also misleading. The material is presented in a way that is not only confusing but also misleading.

As a collection of fragments, historical and otherwise, the book is of little use to the pilot. The material is presented in a way that is not only confusing but also misleading. The material is presented in a way that is not only confusing but also misleading.

The price of this book is undoubtedly



## THE BUYER'S LOG BOOK



## Retractable Landing Light

The new retractable landing light, first announced by the Allied Products Corporation, Detroit, Mich., contains a hot gas-actuated lever for long cable operation with a sufficient side light to produce a complete contrast of about 150 ft. visible at 300 ft. from the ground, when making a landing. This side light enables the pilot to see when engaged in side-light on a short landing field. When installed



Model showing operation of retractable landing light.

in the underside of the wing and in a flying or retracted position, there is no wind resistance and at the same time the light can be directly downward when landing to locate a suitable landing place. The forward projection of the lamp can then be controlled anywhere from 1 deg. to 90 deg.

The lamp is made of a stainless alloy with the exception of the reflector which is made from brass, highly polished, nickel plated and heavily coated with silver. Equipped with 12 volt 420 watt incandescent bulb, it consumes 25 amperes per hour per hour and is run off of a 12-14 volt battery which will run continuously for 15 to 40 min. The lamp is of the fixed type and weighs 4 lb. 9 oz. The lens around which the cable wind to operate the lamp, is or out of the wing is arranged so as to be in the pilot's finger tips.

## Motor Fire Apparatus

The American-LaFrance and Foamite Corporation, Elmhurst, New York, announced last production is now under way on a new series motor fire apparatus, featuring two powerful engines known as the "Supermodel" and "75," a very service tank and a complete line of hand tools. The principal changes include a built hand drive instead of right hand, a new and more sturdy agitator, ground steel tank, ground flange, four wheel brakes, fully enclosed

and of the two-flow type, longer and stronger springs, and higher speed and seal wheels capable of standing a side draft of 3000 lb. All models are equipped with steel and rubber running boards, a dash panel for instruments and compass driver's compartment.

Engines of this line are fitted with a cooling system requiring no auxiliary feed line and allowing the use of air-fuel mixture in cold weather without loss. The new aerial ladders feature a cushion control, enabling one man to raise and lower the ladder in 20 seconds. The entire assembly for raising and lowering ladders is located at one side of the operator, permitting no obstruction in climbing or descending the ladder.

## Spray Painting Equipment

PROVERA UNIT No. 1432, recently introduced by Sprays, Inc., 114 Central Street, Somerville, Mass., is one of the portable types of painting equipment adapted for general use, especially where manual is to be applied which requires common agreement, such as aluminum paint. Included in this unit



Provera unit 1432.

are the model 14-A gun, an LP-12 pressure feed unit, a 24 ft. length 1 in. metal feed pump hose and a 24 ft. length 1 in. heavy duty air hose, both with reversible couplings. The feed unit, driven on C-3 pressure control head P-6 oil and water separator and compressor pump

## TRADE CATALOGS

INDUSTRIAL AVIATION AND AIRCRAFT ENGINE. Of interest to production engineers and designers of airplanes are two booklets, "Industrial Ducting" and "Industrial Airframe," recently published by the Detroit Steel Products Company. These booklets contain a non-restricted presentation of the methods in production of the ducting and airframe of construction, this information being the result of "open house" experimentation by research engineers of the company in co-operation with the Department of Engineering Research of the University of Michigan.

METALWORK AND TOOLS—Brown & Sharpe Mfg. Company present descriptive tables and illustrations of its products in a recent 646 page catalog No. 126. Various types of milling machines, tool and die makers' grinding gear cutting, and motor machines are shown. Among the tools are included arbors and collets, tool holders, jigs, machine cutters, and reamers, gauges and centers. The booklet also contains formulas and tables.

WIRE PRINTING MACHINERY—The C. F. Jones Company of Chicago has issued a 100-page catalog showing their line of wire printing machinery, blue print paper and drawing room fixtures. The catalog shows various sizes of the machinery and features giving directions for operation.

ELECTRIC TOOLS—Catalog No. 2 of 23 pages published by the Western Electric Company, Millers Falls, Mass., describes their new 5 in. bench grinder. Other electric tools included in the booklet are drill, drill attachments, tap sets, die stock, hammer, grinder and air driven. Illustrations and specifications of the tools accompany the descriptions.

material feed pipe for 10 gal. tank, 16 gal. pressure material container, air motor drive system and motor control.

The model 14-A gun has a body of deep forged aluminum alloy. Trigger bar or cone shaped spray can be given without change of nozzle and a locking device holds any setting. In adjustable gun and gun couplings, reduce time at setting up and a locking bar, cover diameter. The gun may be tilted to an angle of 60 deg. without loosening the gun to an extent of 100 ft. in the corner. For operation the gun 1412 requires an air compressor that will deliver at least 60 cfm of free air per minute at a pressure of from 80 to 90 lb.

# "I unloaded at 1000 and my Floyd Smith Safety Chute 'Cracked' IMMEDIATELY"

Writes Lieut. E. Ferné Stewart

"The fast and positive opening surprised everybody, including myself—and the landing itself was another revelation," continued Lieut. Stewart. . . "In all, the chute came through wonderfully."

Lieut. Stewart bought a Safety Chute recently and the above extracts from his letter expresses his satisfaction.

Experienced jumpers are surprised at the quick and positive opening of the Safety Chute. . .

They moved at the ease with which it can be maneuvered and the slow, steady descent. Frank Bethge of Boyers Airport, Ross, Ky., writes: "I have used my Floyd Smith Safety Chute several times, and sure do like its performance. I can truthfully say it is the BEST." These men know parachutes and can readily appreciate the new developments that make the Safety Chute so far superior. . . Its positive three-way opening action direct from the rip, which gives it a quicker opening.

Write for free booklet **COMING DOWN**—it gives a vivid illustrated story of the Safety Chute and the sensational Safety Seat.

Dealers, Distributors, Operators and Schools will be interested in our exclusive sales franchise. . . write for information.

## SWITLIK MANUFACTURING CO.

TRENTON

NEW JERSEY

**5000 Miles Without Service**  
**GRUSS**  
**SHOCK ABSORBERS**

WACO AIRCRAFT RYAN  
PROPRIETARY RIGHTS RESERVED  
PATENTED IN U.S.A. & FOREIGN COUNTRIES

"At no time during the 5,000 miles of the Tour was it necessary to service the units in any way." So says John H. Livingston who piloted his Gruss-equipped Waco "225" to a well deserved victory in the 1929 National Air Tour. Gruss engineers have eliminated the hassles of servicing. The little attention that Gruss Shock Absorbers require can be given as easily as putting new air into your tires, and at far less frequent intervals. And added to this feature is that ever-important fact that Gruss Shock Absorbers make every landing a smooth landing. Now Gruss offers aircraft manufac-



turers a new service... a complete shock absorber unit, streamlined and assembled with fittings ready for installation at your factory. These three features — the elimination of service worry, the assurance of smooth landings and a complete shock unit especially made for your plane, are definite reasons why your 1930 production should include Gruss Shock Absorber units.

**GRUSS AIR SPRING COMPANY**

*all America, Inc.*

Associated Division  
8235 Beverly Blvd., Culver City, Calif., Los Angeles

# BYRD CROSSES SOUTH POLE with **SCINTILLA** AIRCRAFT MAGNETOS in the Ford Tri-Motored Plane "Floyd Bennett" Powered with Wright Engines

**SCINTILLA**  
Aircraft Magnets  
are noted for  
their  
Dependability  
Simplicity  
Accessibility



**SCINTILLA**  
Aircraft Magnets  
served Commander  
Byrd on his North  
Pole Flight, May 9,  
1926, and the Trans-  
Atlantic Flight, June  
28, 1927.



Wright "Cyclone"

Scintilla Aircraft  
Magnets  
are standard equip-  
ment on all Wright  
Aeronautical Engines.



Wright "Whitcomb Nine"

The majority of modern  
Aeronautical Engines  
are equipped with  
Scintilla Aircraft Magnets.

**SCINTILLA MAGNETO CO. INC.**  
**SIDNEY - NEW YORK**

Contractors to the U.S. Army and Navy





## Fokker Planes Fly Universal Lanes

Out of the sky comes the modern business man... refreshed, eager. Through the air... where the way is straight, swift, and close... he saves many precious hours of wearisome travel and finds that remote cities have become neighbors.

His trip is always pleasant, and relaxing. The world below drifts into a background. Fokker are everywhere today. Cultivate forward vision in the beautiful checkerboard pattern. Close shrink to any village, then reason to fine big cities and to faraway cities.

His return is assured as the Fokker glides gently to its landing place... at Chicago, at Cleveland, at Kansas City, at St. Louis, at Tulsa, at Oklahoma City.

"Cheaper" always, in a Universal Air Lane. Fokker planes have been chosen for Universal Air Lane Systems to assure the speed, comfort and safety necessary for the modern and business-minded traveler.

Other commercial lines using Fokker super trimotor air lanes are: Western Air Express, Southern Air Transport, Pan-American Airways, Standard Air Lines, National Parks Airways, Dominion Airways, Western Canada Airways.

If interested in air travel, send a 5-cent stamp for joy and mail stamps, and we will send you our diamond brooch, "What An Travel Pays." Address: the Fokker Travel Bureau, 22nd Floor, 205 Madison Avenue, New York City, Room 2100.

**FOKKER AIRCRAFT CORPORATION OF AMERICA**

Factory: WILMING, WEST VIRGINIA, and TETERBROOK AIRPORT, HANOVER, MICHIGAN, NEW JERSEY  
Address inquiries: NEW YORK OFFICE, 1775 BROADWAY

## SOCIÉTÉ LORRAINE

200 ROUTE DE BEZONS  
A ARGENTEUIL. (S. & O.)

TÉLÉPHONE  
WAGRAM: 59-57

REG. COMMERCE  
SEINE, N° 111 677



## MOTEURS D'AVIATION LORRAINE



400/100 H.P. 15 C.V. 15



400/100 H.P. 15 C.V. 15



400/100 H.P. 15 C.V. 15



400/100 H.P. 15 C.V. 15



400/100 H.P. 15 C.V. 15



300/100 H.P. 15 C.V. 15



300/100 H.P. 15 C.V. 15



300/100 H.P. 15 C.V. 15



400/100 H.P. 15 C.V. 15

Marine Motors of 250 and 500 H.P.  
Automobiles 15 H.P. Sport and Touring Models



# Gulfpride Oil

## AMERICA'S FINEST AVIATION OIL



### GULFPRIDE OILS

provide to the highest extent these desirable features necessary for satisfactory operation of Aviation Motors.

- 1 Oil economy—due to their extremely long life resistance to oxidation and low volatility.
- 2 Lowered maintenance—because of proper lubricating qualities and very low carbon and gum forming characteristics.
- 3 Proper lubrication—a guide for each motor and conditions of operation.
- 4 High quality—exhibit minimum change of body under extremes of temperature.

GULFPRIDE OILS are approved by leading Aviation Engine Builders.



Manufactured for Aviation Engine Lubrication  
in five grades or body designations:

Gulfpride Oil 75 Gulfpride Oil 120  
Gulfpride Oil 100 Gulfpride Oil 150  
Gulfpride Oil 200

### GULF REFINING COMPANY

General Offices: PITTSBURGH, PA.

District Offices  
BOSTON

NEW YORK  
PHILADELPHIA  
LOUISVILLE  
ATLANTA  
NEW ORLEANS  
HOUSTON

Refineries

BAYONNE, N. J.  
PHILADELPHIA, PA.  
PORT ARTHUR, TEX.



## CONSOLIDATED INSTRUMENTS



# New

WITH A WEALTH OF NEW MEANINGS



**TACHOMETER**, designed and made by the instrument makers of the First Division of the Consolidated Instrument Co. of America, Inc. First in their traditions of fifty years, they welcome the most exacting standards of criticism.

No other Tachometer, save the new instrument of First, embodies the following assemblage of values.

A perfect linear scale.

Helical gear drive for smooth and quiet operation.

Endorsements on rapidly rotating parts.

Synchromesh case of corrosion resistant alloy.

Gold plated internal parts.

Modern transmission through a jeweled pin riding on a polished bronze slide.

Only four pieces in complete assembly of lubricating mechanism.

Open scale dial readable to 10 R. P. M.

Accuracy maintained through patented features.

The Tachometer, here presented to the favorable consideration of Airplane manufacturers and pilots and fleet, has successfully passed the severest tests for American Aeronautical Instruments.

### CONSOLIDATED INSTRUMENT CO.

of AMERICA, INC.

345 EAST 40th STREET - NEW YORK CITY

Districts

John F. Price and Sons Inc., Baltimore, Md.

Motrol Instrument Co., St. Vincent, N. Y.

Alcock Instrument Corp., Philadelphia, Pa.

Western Sales Manager

M. E. Price, 3101 Broadway, Oakland, Calif.







## AIRPLANE MECHANICS

*Fundamental factors to be considered in design, construction and control of heavier-than-air craft.*

### The Airplane and Its Engine

By C. H. CHAFFIN  
and C. F. TAYLOR

*Descriptive Professor in the "Power in Aircraft" Department of the University of Wisconsin.*

**H**ERE is a sound, clear and simple exposition of the fundamental principles, construction and operation of the airplane and its engine. The book takes a step-by-step approach to the subject, covering the complete "power" system. It includes the latest, reliable methods for the designing engineer.

It is a complete book, but also only a knowledge of elementary physics and mechanics is required. There are 200 photographs and captions.

#### the book covers such topics as:

- the life of a wing—developing the theory from Bernoulli's laws of flow
- the means for wing shapes
- Monoplane and biplane construction
- Evolution of all air leaders in use
- How and why airplane shapes designed to reduce their wind resistance
- Stability and airplane control
- the engine—its principles and construction
- the complete power plant
- construction of the modern airplane
- types of airplane engine construction and operation

379 pages, \$1 25  
200 illustrations, \$2.50

#### SEE YOUR COPY FOR 10 DAYS FREE

Should you wish to return the copy after 10 days, no return is necessary. If you wish to keep it, please send \$2.50 for the book and \$1.00 for the copy.

### MC GRAW-HILL FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 1221 Avenue of the Americas, New York

Send me Chaffin and Taylor's "The Airplane and Its Engine," \$1.25 for the book and \$1.00 for the copy. I will return the book and copy to you after 10 days.

Name

Address

City and State

Other Address

Name of Dealer

Book sent to me upon receipt of \$2.50 for the book and \$1.00 for the copy. I will return the book and copy to you after 10 days.

## GENERAL ELECTRIC SUPERCHARGERS

*A Contribution to the Safety and Progress of Flight*



Over-driven, vaporizing supercharger

G-E vaporizing superchargers are small, gas-driven, high-speed, centrifugal compressors, built-in as part of an airplane engine, and serving the following purposes:

1. Improvement in distribution.
2. Simplification of carburetors.
3. Moderate or appreciable increase of power at sea level.
4. Appreciable increase of power at medium altitudes.

G-E vaporizing superchargers are standard equipment on leading aviation engines.

The General Electric Company also manufactures the exhaust-driven supercharger used in all high-altitude work by the United States Army.



FOR ALL THE MODERN ELECTRIC MOTOR EQUIPMENT SEE LISTING IN "E. E. M." P. 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

## GENERAL ELECTRIC

General Electric Co., Schenectady, N. Y. Sales Office in Principal Cities

## An airport is only as good as its hangars!



A **CONCRETE** building, open country, long, level, smooth—well of them hangars built by the Maryland Building Company.

With a Maryland State Engineer's license, we are experienced in building the most modern hangars.

Full opening, daylight, modern, built-in, concrete, steel, and wood. We build hangars of all sizes, from 100 to 10,000 sq. ft. We build hangars of all types, from simple to complex. We build hangars of all materials, from concrete to steel to wood. We build hangars of all shapes, from rectangular to circular to irregular. We build hangars of all colors, from white to gray to brown. We build hangars of all finishes, from smooth to rough to polished. We build hangars of all prices, from cheap to expensive.

Send today for your copy of our new booklet, "How to Build a Hangar."



## HOLLEY AIRPLANE CARBURETOR



Model No. 400-410 1/2, 1 1/2, 2, 2 1/2, 3, 3 1/2, 4, 4 1/2, 5, 5 1/2, 6, 6 1/2, 7, 7 1/2, 8, 8 1/2, 9, 9 1/2, 10, 10 1/2, 11, 11 1/2, 12, 12 1/2, 13, 13 1/2, 14, 14 1/2, 15, 15 1/2, 16, 16 1/2, 17, 17 1/2, 18, 18 1/2, 19, 19 1/2, 20, 20 1/2, 21, 21 1/2, 22, 22 1/2, 23, 23 1/2, 24, 24 1/2, 25, 25 1/2, 26, 26 1/2, 27, 27 1/2, 28, 28 1/2, 29, 29 1/2, 30, 30 1/2, 31, 31 1/2, 32, 32 1/2, 33, 33 1/2, 34, 34 1/2, 35, 35 1/2, 36, 36 1/2, 37, 37 1/2, 38, 38 1/2, 39, 39 1/2, 40, 40 1/2, 41, 41 1/2, 42, 42 1/2, 43, 43 1/2, 44, 44 1/2, 45, 45 1/2, 46, 46 1/2, 47, 47 1/2, 48, 48 1/2, 49, 49 1/2, 50, 50 1/2, 51, 51 1/2, 52, 52 1/2, 53, 53 1/2, 54, 54 1/2, 55, 55 1/2, 56, 56 1/2, 57, 57 1/2, 58, 58 1/2, 59, 59 1/2, 60, 60 1/2, 61, 61 1/2, 62, 62 1/2, 63, 63 1/2, 64, 64 1/2, 65, 65 1/2, 66, 66 1/2, 67, 67 1/2, 68, 68 1/2, 69, 69 1/2, 70, 70 1/2, 71, 71 1/2, 72, 72 1/2, 73, 73 1/2, 74, 74 1/2, 75, 75 1/2, 76, 76 1/2, 77, 77 1/2, 78, 78 1/2, 79, 79 1/2, 80, 80 1/2, 81, 81 1/2, 82, 82 1/2, 83, 83 1/2, 84, 84 1/2, 85, 85 1/2, 86, 86 1/2, 87, 87 1/2, 88, 88 1/2, 89, 89 1/2, 90, 90 1/2, 91, 91 1/2, 92, 92 1/2, 93, 93 1/2, 94, 94 1/2, 95, 95 1/2, 96, 96 1/2, 97, 97 1/2, 98, 98 1/2, 99, 99 1/2, 100, 100 1/2, 101, 101 1/2, 102, 102 1/2, 103, 103 1/2, 104, 104 1/2, 105, 105 1/2, 106, 106 1/2, 107, 107 1/2, 108, 108 1/2, 109, 109 1/2, 110, 110 1/2, 111, 111 1/2, 112, 112 1/2, 113, 113 1/2, 114, 114 1/2, 115, 115 1/2, 116, 116 1/2, 117, 117 1/2, 118, 118 1/2, 119, 119 1/2, 120, 120 1/2, 121, 121 1/2, 122, 122 1/2, 123, 123 1/2, 124, 124 1/2, 125, 125 1/2, 126, 126 1/2, 127, 127 1/2, 128, 128 1/2, 129, 129 1/2, 130, 130 1/2, 131, 131 1/2, 132, 132 1/2, 133, 133 1/2, 134, 134 1/2, 135, 135 1/2, 136, 136 1/2, 137, 137 1/2, 138, 138 1/2, 139, 139 1/2, 140, 140 1/2, 141, 141 1/2, 142, 142 1/2, 143, 143 1/2, 144, 144 1/2, 145, 145 1/2, 146, 146 1/2, 147, 147 1/2, 148, 148 1/2, 149, 149 1/2, 150, 150 1/2, 151, 151 1/2, 152, 152 1/2, 153, 153 1/2, 154, 154 1/2, 155, 155 1/2, 156, 156 1/2, 157, 157 1/2, 158, 158 1/2, 159, 159 1/2, 160, 160 1/2, 161, 161 1/2, 162, 162 1/2, 163, 163 1/2, 164, 164 1/2, 165, 165 1/2, 166, 166 1/2, 167, 167 1/2, 168, 168 1/2, 169, 169 1/2, 170, 170 1/2, 171, 171 1/2, 172, 172 1/2, 173, 173 1/2, 174, 174 1/2, 175, 175 1/2, 176, 176 1/2, 177, 177 1/2, 178, 178 1/2, 179, 179 1/2, 180, 180 1/2, 181, 181 1/2, 182, 182 1/2, 183, 183 1/2, 184, 184 1/2, 185, 185 1/2, 186, 186 1/2, 187, 187 1/2, 188, 188 1/2, 189, 189 1/2, 190, 190 1/2, 191, 191 1/2, 192, 192 1/2, 193, 193 1/2, 194, 194 1/2, 195, 195 1/2, 196, 196 1/2, 197, 197 1/2, 198, 198 1/2, 199, 199 1/2, 200, 200 1/2, 201, 201 1/2, 202, 202 1/2, 203, 203 1/2, 204, 204 1/2, 205, 205 1/2, 206, 206 1/2, 207, 207 1/2, 208, 208 1/2, 209, 209 1/2, 210, 210 1/2, 211, 211 1/2, 212, 212 1/2, 213, 213 1/2, 214, 214 1/2, 215, 215 1/2, 216, 216 1/2, 217, 217 1/2, 218, 218 1/2, 219, 219 1/2, 220, 220 1/2, 221, 221 1/2, 222, 222 1/2, 223, 223 1/2, 224, 224 1/2, 225, 225 1/2, 226, 226 1/2, 227, 227 1/2, 228, 228 1/2, 229, 229 1/2, 230, 230 1/2, 231, 231 1/2, 232, 232 1/2, 233, 233 1/2, 234, 234 1/2, 235, 235 1/2, 236, 236 1/2, 237, 237 1/2, 238, 238 1/2, 239, 239 1/2, 240, 240 1/2, 241, 241 1/2, 242, 242 1/2, 243, 243 1/2, 244, 244 1/2, 245, 245 1/2, 246, 246 1/2, 247, 247 1/2, 248, 248 1/2, 249, 249 1/2, 250, 250 1/2, 251, 251 1/2, 252, 252 1/2, 253, 253 1/2, 254, 254 1/2, 255, 255 1/2, 256, 256 1/2, 257, 257 1/2, 258, 258 1/2, 259, 259 1/2, 260, 260 1/2, 261, 261 1/2, 262, 262 1/2, 263, 263 1/2, 264, 264 1/2, 265, 265 1/2, 266, 266 1/2, 267, 267 1/2, 268, 268 1/2, 269, 269 1/2, 270, 270 1/2, 271, 271 1/2, 272, 272 1/2, 273, 273 1/2, 274, 274 1/2, 275, 275 1/2, 276, 276 1/2, 277, 277 1/2, 278, 278 1/2, 279, 279 1/2, 280, 280 1/2, 281, 281 1/2, 282, 282 1/2, 283, 283 1/2, 284, 284 1/2, 285, 285 1/2, 286, 286 1/2, 287, 287 1/2, 288, 288 1/2, 289, 289 1/2, 290, 290 1/2, 291, 291 1/2, 292, 292 1/2, 293, 293 1/2, 294, 294 1/2, 295, 295 1/2, 296, 296 1/2, 297, 297 1/2, 298, 298 1/2, 299, 299 1/2, 300, 300 1/2, 301, 301 1/2, 302, 302 1/2, 303, 303 1/2, 304, 304 1/2, 305, 305 1/2, 306, 306 1/2, 307, 307 1/2, 308, 308 1/2, 309, 309 1/2, 310, 310 1/2, 311, 311 1/2, 312, 312 1/2, 313, 313 1/2, 314, 314 1/2, 315, 315 1/2, 316, 316 1/2, 317, 317 1/2, 318, 318 1/2, 319, 319 1/2, 320, 320 1/2, 321, 321 1/2, 322, 322 1/2, 323, 323 1/2, 324, 324 1/2, 325, 325 1/2, 326, 326 1/2, 327, 327 1/2, 328, 328 1/2, 329, 329 1/2, 330, 330 1/2, 331, 331 1/2, 332, 332 1/2, 333, 333 1/2, 334, 334 1/2, 335, 335 1/2, 336, 336 1/2, 337, 337 1/2, 338, 338 1/2, 339, 339 1/2, 340, 340 1/2, 341, 341 1/2, 342, 342 1/2, 343, 343 1/2, 344, 344 1/2, 345, 345 1/2, 346, 346 1/2, 347, 347 1/2, 348, 348 1/2, 349, 349 1/2, 350, 350 1/2, 351, 351 1/2, 352, 352 1/2, 353, 353 1/2, 354, 354 1/2, 355, 355 1/2, 356, 356 1/2, 357, 357 1/2, 358, 358 1/2, 359, 359 1/2, 360, 360 1/2, 361, 361 1/2, 362, 362 1/2, 363, 363 1/2, 364, 364 1/2, 365, 365 1/2, 366, 366 1/2, 367, 367 1/2, 368, 368 1/2, 369, 369 1/2, 370, 370 1/2, 371, 371 1/2, 372, 372 1/2, 373, 373 1/2, 374, 374 1/2, 375, 375 1/2, 376, 376 1/2, 377, 377 1/2, 378, 378 1/2, 379, 379 1/2, 380, 380 1/2, 381, 381 1/2, 382, 382 1/2, 383, 383 1/2, 384, 384 1/2, 385, 385 1/2, 386, 386 1/2, 387, 387 1/2, 388, 388 1/2, 389, 389 1/2, 390, 390 1/2, 391, 391 1/2, 392, 392 1/2, 393, 393 1/2, 394, 394 1/2, 395, 395 1/2, 396, 396 1/2, 397, 397 1/2, 398, 398 1/2, 399, 399 1/2, 400, 400 1/2, 401, 401 1/2, 402, 402 1/2, 403, 403 1/2, 404, 404 1/2, 405, 405 1/2, 406, 406 1/2, 407, 407 1/2, 408, 408 1/2, 409, 409 1/2, 410, 410 1/2, 411, 411 1/2, 412, 412 1/2, 413, 413 1/2, 414, 414 1/2, 415, 415 1/2, 416, 416 1/2, 417, 417 1/2, 418, 418 1/2, 419, 419 1/2, 420, 420 1/2, 421, 421 1/2, 422, 422 1/2, 423, 423 1/2, 424, 424 1/2, 425, 425 1/2, 426, 426 1/2, 427, 427 1/2, 428, 428 1/2, 429, 429 1/2, 430, 430 1/2, 431, 431 1/2, 432, 432 1/2, 433, 433 1/2, 434, 434 1/2, 435, 435 1/2, 436, 436 1/2, 437, 437 1/2, 438, 438 1/2, 439, 439 1/2, 440, 440 1/2, 441, 441 1/2, 442, 442 1/2, 443, 443 1/2, 444, 444 1/2, 445, 445 1/2, 446, 446 1/2, 447, 447 1/2, 448, 448 1/2, 449, 449 1/2, 450, 450 1/2, 451, 451 1/2, 452, 452 1/2, 453, 453 1/2, 454, 454 1/2, 455, 455 1/2, 456, 456 1/2, 457, 457 1/2, 458, 458 1/2, 459, 459 1/2, 460, 460 1/2, 461, 461 1/2, 462, 462 1/2, 463, 463 1/2, 464, 464 1/2, 465, 465 1/2, 466, 466 1/2, 467, 467 1/2, 468, 468 1/2, 469, 469 1/2, 470, 470 1/2, 471, 471 1/2, 472, 472 1/2, 473, 473 1/2, 474, 474 1/2, 475, 475 1/2, 476, 476 1/2, 477, 477 1/2, 478, 478 1/2, 479, 479 1/2, 480, 480 1/2, 481, 481 1/2, 482, 482 1/2, 483, 483 1/2, 484, 484 1/2, 485, 485 1/2, 486, 486 1/2, 487, 487 1/2, 488, 488 1/2, 489, 489 1/2, 490, 490 1/2, 491, 491 1/2, 492, 492 1/2, 493, 493 1/2, 494, 494 1/2, 495, 495 1/2, 496, 496 1/2, 497, 497 1/2, 498, 498 1/2, 499, 499 1/2, 500, 500 1/2, 501, 501 1/2, 502, 502 1/2, 503, 503 1/2, 504, 504 1/2, 505, 505 1/2, 506, 506 1/2, 507, 507 1/2, 508, 508 1/2, 509, 509 1/2, 510, 510 1/2, 511, 511 1/2, 512, 512 1/2, 513, 513 1/2, 514, 514 1/2, 515, 515 1/2, 516, 516 1/2, 517, 517 1/2, 518, 518 1/2, 519, 519 1/2, 520, 520 1/2, 521, 521 1/2, 522, 522 1/2, 523, 523 1/2, 524, 524 1/2, 525, 525 1/2, 526, 526 1/2, 527, 527 1/2, 528, 528 1/2, 529, 529 1/2, 530, 530 1/2, 531, 531 1/2, 532, 532 1/2, 533, 533 1/2, 534, 534 1/2, 535, 535 1/2, 536, 536 1/2, 537, 537 1/2, 538, 538 1/2, 539, 539 1/2, 540, 540 1/2, 541, 541 1/2, 542, 542 1/2, 543, 543 1/2, 544, 544 1/2, 545, 545 1/2, 546, 546 1/2, 547, 547 1/2, 548, 548 1/2, 549, 549 1/2, 550, 550 1/2, 551, 551 1/2, 552, 552 1/2, 553, 553 1/2, 554, 554 1/2, 555, 555 1/2, 556, 556 1/2, 557, 557 1/2, 558, 558 1/2, 559, 559 1/2, 560, 560 1/2, 561, 561 1/2, 562, 562 1/2, 563, 563 1/2, 564, 564 1/2, 565, 565 1/2, 566, 566 1/2, 567, 567 1/2, 568, 568 1/2, 569, 569 1/2, 570, 570 1/2, 571, 571 1/2, 572, 572 1/2, 573, 573 1/2, 574, 574 1/2, 575, 575 1/2, 576, 576 1/2, 577, 577 1/2, 578, 578 1/2, 579, 579 1/2, 580, 580 1/2, 581, 581 1/2, 582, 582 1/2, 583, 583 1/2, 584, 584 1/2, 585, 585 1/2, 586, 586 1/2, 587, 587 1/2, 588, 588 1/2, 589, 589 1/2, 590, 590 1/2, 591, 591 1/2, 592, 592 1/2, 593, 593 1/2, 594, 594 1/2, 595, 595 1/2, 596, 596 1/2, 597, 597 1/2, 598, 598 1/2, 599, 599 1/2, 600, 600 1/2, 601, 601 1/2, 602, 602 1/2, 603, 603 1/2, 604, 604 1/2, 605, 605 1/2, 606, 606 1/2, 607, 607 1/2, 608, 608 1/2, 609, 609 1/2, 610, 610 1/2, 611, 611 1/2, 612, 612 1/2, 613, 613 1/2, 614, 614 1/2, 615, 615 1/2, 616, 616 1/2, 617, 617 1/2, 618, 618 1/2, 619, 619 1/2, 620, 620 1/2, 621, 621 1/2, 622, 622 1/2, 623, 623 1/2, 624, 624 1/2, 625, 625 1/2, 626, 626 1/2, 627, 627 1/2, 628, 628 1/2, 629, 629 1/2, 630, 630 1/2, 631, 631 1/2, 632, 632 1/2, 633, 633 1/2, 634, 634 1/2, 635, 635 1/2, 636, 636 1/2, 637, 637 1/2, 638, 638 1/2, 639, 639 1/2, 640, 640 1/2, 641, 641 1/2, 642, 642 1/2, 643, 643 1/2, 644, 644 1/2, 645, 645 1/2, 646, 646 1/2, 647, 647 1/2, 648, 648 1/2, 649, 649 1/2, 650, 650 1/2, 651, 651 1/2, 652, 652 1/2, 653, 653 1/2, 654, 654 1/2, 655, 655 1/2, 656, 656 1/2, 657, 657 1/2, 658, 658 1/2, 659, 659 1/2, 660, 660 1/2, 661, 661 1/2, 662, 662 1/2, 663, 663 1/2, 664, 664 1/2, 665, 665 1/2,



## The Monoprep

This sturdy training plane has become standard equipment for students training by a large and rapidly increasing number of the most prominent aviation schools in the country.

The Monoprep is of the open type with side by side seating which permits constant communication between instructor and student while in the air. This results in a more thorough and rapid training. Special attention has been paid to visibility. Perfect vision in all directions is provided by a large canvas air struts of wing and open construction of the cockpit.



Each rubber pedal, control sticks and throttle, as illustrated herewith, are bottom levers, as well as the adjustable stabilizer and airtight windows so that the seat pack parachute may be worn if desired. Doors on each side of the cockpit permit independent entrance and exit.

Instruments include altimeter, tachometer, clock, oil pressure, temperature gauges and gasoline gauge.

The Monoprep's low initial cost means two clips on the line at the usual cost of one. Operates for approximately \$1.00 per hour for fuel. The Monoprep allows schools to charge less for instruction and still show greater profit.

Complete specifications and performance data will gladly be sent upon request.

Eligible—Fleetway Model, Number

Department of Commerce  
Certificate of Approval No. 218

## Mono Aircraft Corporation

Subsidiary of Allied American Delineata, Inc.  
MOLINE, ILLINOIS



## PERFECT FLYING VISION



## LUXOR GOGGLES by Ed. H. H. H.

Send for catalog 520 Fifth Ave. New York

## LE BLOND "90"



Approved Type Certificate No. 26

The Le Blond "90" is the most powerful engine in the "Le Blond" line. It is a 100-horsepower engine and only weighs 1,000 lbs. It is a 100-horsepower engine and only weighs 1,000 lbs. It is a 100-horsepower engine and only weighs 1,000 lbs.

The Le Blond "90" is the most powerful engine in the "Le Blond" line. It is a 100-horsepower engine and only weighs 1,000 lbs. It is a 100-horsepower engine and only weighs 1,000 lbs.

### A Few Installations

Army Corps	Army	Naval Air
Naval Air Corps	Naval	Naval Air Corps
Naval Air Corps	Naval	Naval Air Corps
Naval Air Corps	Naval	Naval Air Corps



## DEPENDABLE

- as to test
- in meeting difficult or fussy requirements
- in being up to specifications
- in service
- in meeting ever-changing delivery schedules
- as to spend for experimental work

May we figure on your requirements?

THE WALLACE BARNES CO.  
BRISTOL, CONNECTICUT

**Barnes** made  
SPRINGS  
BARNES SPRING CO. BRISTOL, CONNECTICUT



## IN THE FOG

One of the most comforting instruments to have on your board when you get caught in the fog is an Elgin Avigo Bell Bank Indicator.

It has this advantage over the old bubble type of indicator . . . it doesn't indicate in reverse but follows the motion of the ship. Absolute accurate check upon your "feel" of the ship.

Made by ELGIN . . . makers of precision instruments for 60 years.



Aircraft Instrument Division

ELGIN  
NATIONAL WATCH CO.

ELGIN ILLINOIS





**THE STAR  
PATHFINDER  
COMPASS**

At the bottom of the World with the Byrd Antarctic Expedition PICKED by Commander Byrd, the Star Pathfinder Compass aeroplanes have the most direct indication—the compass of the South Pole.

AT THE BOTTOM OF THE WORLD on the drifting field in the South Pole—Commander Byrd, the greatest of all explorers, preferred the dependability and accuracy of accurate Avian Pathfinders: the STAR PATHFINDER MAGNETIC COMPASS.

Write for complete information about current types.

INTERVIEW WITH  
STAR COMPASS COMPANY  
EAST WILTON, MASSACHUSETTS

Continental Salesmen Co. of America  
New York City Office  
HEAD BY ALL AERONAUTICAL DEALERS

## HALL-ALUMINUM AIRCRAFT CORPORATION

*Strong, Light Weight*

## ALL-METAL

*Airplanes, Seaplanes,  
Flying Boats and Floats*

*Standardized Drawn Sections and  
Stamped Parts Adaptable to Your  
Present Designs or New  
Designs Supplied*

2050 ELMWOOD AVENUE  
BUFFALO, NEW YORK

Contractors to U. S. Navy



**JAEGER**

5 Day Watch Chronograph 8 Day

Time of Flight Watch, 8 Day

HEED to the fact, used by aviators everywhere, for the Jaeger watches are specially designed to be accurate under all conditions of altitude, vibration, shock or motion and temperature. (Showings) in time of flight watches. Aviators' standard time of flight watches.

104 EAST 40th ST., NEW YORK CITY  
London Chicago International Bucharest

**AERONAUTICAL  
TIMEPIECES**

## PITCAIRN AIRCRAFT



For Air Mail use . . . SUPER MAILING

For Sport or Private use . . . SPORT MAILING

PITCAIRN AIRCRAFT, Inc.  
Bryn Athyn, Penna.

## Who are They?

William W. Miller, Chief of Research, recognized as an outstanding expert in aerodynamics, designed the most famous of all U. S. F. and was in charge of the famous research laboratory, East of Ohio.

Chief of Research, formerly at the University of California, later in charge of the German aerodynamic section. Expert from Chicago of U. S. Army.



**BERLINER-JOYCE  
AIRCRAFT CORPORATION**  
BALTIMORE MARYLAND

# SKI Equipment



. . . with "Oildraulic"  
Shock Absorbing Device

This SKI, produced by the Aircraft Products Corporation, is creating widespread interest throughout the aircraft industry. Due to the ingenious arrangement of the shock absorbing mechanism, which provides even greater resistance than the airplane tire, this SKI may be used on standard landing gear . . . simply remove the wheels and install the SKI on your standard axle—no changes necessary. Aircraft Products Corporation's engineering staff, recognized as national authorities, are ready to co-operate with you in problems of design or adaptation. Write for complete information and prices on standard SKI equipment for your planes.

**AIRCRAFT PRODUCTS CORPORATION  
OF AMERICA  
DETROIT, MICHIGAN**

Devises and manufactures of Landing Wheels  
Main, Wing, Tail and Auxiliary Landing  
Wheels, Tire, and Complete Subassemblies  
Tire, Wing, Tail, Landing Gear, and Landing  
Gear, Landing Gear and Landing Gear.

**Aircraft Products  
CORPORATION**



Interior of plane with special Sikorsky Landing Gear, designed by Sikorsky Aircraft Corp., United States Army.

## Sikorsky cabin interior beautifully paneled in Bakelite Laminated

Possessing the exceptional advantage of combining strength with light weight, Bakelite Laminated also provides a highly durable finish of rich beauty. Recent aircraft applications of this material include the interior paneling of a Sikorsky amphibian.

These Bakelite Laminated panels are non-flammable, and much stronger than wood of any comparable thickness. Disabused by moisture, they will not swell or shrink, crack or split from exposure to adverse weather conditions or salt air.

Bakelite Laminated panel material is made to closely resemble mahogany and walnut in both color and markings and also in several plain colors. It is made by our licensee, The Formica Insulation Co., Cincinnati, Ohio, who will be glad to send complete information upon request.

Manufacturers are invited to write for information to Bakelite Co., Cincinnati, Ohio.

**BAKELITE CORPORATION**  
217 Park Avenue New York 17 N. Y.  
Chicago Office 1110 W. Third Street  
BAKELITE CORP. OF CANADA, LTD.  
100 Dufferin Street Toronto, Ontario

**BAKELITE**

THE MATERIAL OF (USE) A THOUSAND USES



The Department of Commerce has approved the new Brownback C-400.

Featured by simplicity of construction, economy of operation and low t. p. m. this new aircraft engine is ideal for commercial flying.

**BROWNBACK**  
AIRCRAFT ENGINES  
Pottstown, Pa.



## Heat Treated Forgings

Greatest strength with least weight

We are pioneers in the production of highest grade aircraft and automotive forgings, and we can here give you the most up-to-date heat-treating plants in the country.

Count on us for requirements. We will gladly plan our machinery and resources to your demand.

The Endicott Forging & Mfg. Co., Inc.  
10 North Street, Endicott, N. Y.

**ENDICOTT**

"The forging people who really"

**U SPECIAL AVIATION PISTON RINGS**

### Undersealers

Riv. Alloys  
Alloys  
American Claws  
E. W. Sells  
Covers

### Covers

Pistons  
Fuel & Water  
Wings  
and many others

See full page advertisement in several issues of "The Aviation Engineer" and "The Aviation News".

C. S. Thompson Press Bldg. Co., Paterson, N. J.

## PERRY-AUSTEN

Don't Crack  
Don't Peel  
Don't Rot

Good Take Up  
Good Fill  
Easy to Apply

These essential qualities of good dope are demanded by experienced aircraft manufacturers. That they are obtained in PERRY-AUSTEN DOPES has been proven by Government and independent laboratory tests and is proved further by thousands of military and commercial aircraft.

PERRY-AUSTEN DOPES are produced by the oldest manufacturers of aircraft dope in the United States and they are used by many of America's foremost aircraft manufacturers. Ask for no quotation, whether for large or small quantities.

Manufacturers in United States Government

PERRY-AUSTEN MFG. CO.

Main Office and Works: Greenport, Green Island, N. Y.

Tel. Orange 1044

"Single" 1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 1111 N. 1111 N.

1111 N. 111

# Here It Is In One AN EIGHT DAY CLOCK and RECORDING INSTRUMENT



THE  
EIGHT-DAY  
\$28.00

Keep an Accurate Record of Engine and Flying Time  
The Eight Day Clock is the most accurate and reliable flying time recorder yet devised. It is a 24-hour clock which records the engine and flying time of an airplane.

By knowing the efficiency of your plane you obtain the most accurate record of engine and flying time. This is the only flying time recorder that is accurate, reliable, and easy to use. It is the only flying time recorder that is accurate, reliable, and easy to use. It is the only flying time recorder that is accurate, reliable, and easy to use.

It is the only flying time recorder that is accurate, reliable, and easy to use. It is the only flying time recorder that is accurate, reliable, and easy to use. It is the only flying time recorder that is accurate, reliable, and easy to use.

U. S. Fane  
Recording Co., Inc.

510 W. 54th St.  
New York, N. Y.



# COLONIAL GRAIN UPHOLSTERY LEATHER

made by

EAGLE-OTTAWA LEATHER COMPANY  
Grand Haven, Mich.

Genuine leather for airplanes is  
NON-INFLAMMABLE durable and clean.

Sample books furnished on application

810 W. 54th St.  
New York, N. Y.

810 W. 54th St.  
New York, N. Y.

# In Aviation it's TUBING by SUMMERILL

Manufacturers Since  
1899



Summerill Tubing Co.  
Bridgport (Conn.)  
Phone (Philo. Area)



United States of America, Inc. is an Airplane, Motor, and accessories in America.

# Airport Engineering Experience

COMPLETE airports, hangars, aircraft facilities, of Austin design and construction, from Coast to Coast, truly to the seasoned experience of Austin Airport Engineers.

For information on any type of airport, please the Austin office, write or wire.

THE AUSTIN COMPANY  
Airport Engineers and Builders CLEVELAND

2700 E. 12th St., Cleveland, Ohio, U.S.A.  
Cleveland, Ohio, U.S.A.



# Lined Winter Helmets



200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

200 COMMERCIAL ST. N. Larchmont, N.Y.  
10538

# AIRCRAFT SERVICE DIRECTORY

Complete Stock Aircraft Parts and Supplies  
We have all aircraft parts, accessories, and supplies in stock. We are the largest stockholder in the U.S. and have the best prices. We are the largest stockholder in the U.S. and have the best prices. We are the largest stockholder in the U.S. and have the best prices.

DANIEL GUGGENHEIM SCHOOL OF AERONAUTICS  
The Guggenheim School of Aeronautics is the largest and most complete school of aeronautics in the world. It is the largest and most complete school of aeronautics in the world. It is the largest and most complete school of aeronautics in the world.

Patent/Your Ideas  
We have all aircraft parts, accessories, and supplies in stock. We are the largest stockholder in the U.S. and have the best prices. We are the largest stockholder in the U.S. and have the best prices. We are the largest stockholder in the U.S. and have the best prices.

Airplane Covers  
We have all aircraft parts, accessories, and supplies in stock. We are the largest stockholder in the U.S. and have the best prices. We are the largest stockholder in the U.S. and have the best prices. We are the largest stockholder in the U.S. and have the best prices.

OSTERGAARD  
AIRCRAFT  
4100 W. 12th Street, Chicago, Ill.

AVIATION PROTECTION  
INSURANCE BROKERS TO AVIATION  
10 WILLIAM STREET  
NEW YORK

HASKELITE  
Used for many aircraft parts. Being used in the manufacture of aircraft parts. Being used in the manufacture of aircraft parts. Being used in the manufacture of aircraft parts.

Motorize Your Hangar Doors  
Allen & Davis, Inc.  
Cincinnati, Ohio

STEARMAN and AEROMARINE KLEMM  
200 W. 12th St.  
Chicago, Ill.

PITCH INDICATOR  
Additive for  
Pitch Indicator  
Pitch Indicator

Northeast  
Pitch Indicator  
Pitch Indicator

For Professional Services Consult  
Page 43

See our Advertisement  
On Radio and TV. See our  
PIONEER INSTRUMENT COMPANY  
1000 Broadway, New York

PITCH & BANK INDICATOR  
Your Pitch and Bank Indicator  
Pitch and Bank Indicator

STARBUCK  
Starbuck  
Starbuck

JOHN S. CON & SON  
Aviation Supplies  
1000 Broadway, New York

TRIUMPH  
Triumph  
Triumph

TRIUMPH  
Triumph  
Triumph

TRIUMPH  
Triumph  
Triumph

ALL-AMERICAN GLIDER KIT  
Complete with 200  
Price \$50

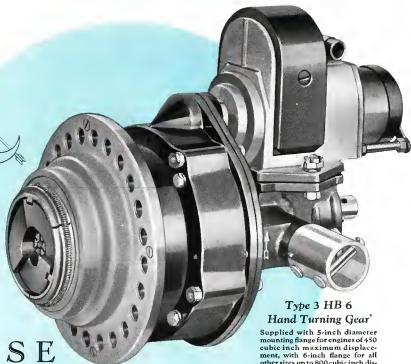
ALL-AMERICAN GLIDER KIT  
Complete with 200  
Price \$50











**Type 3 HB 6  
Hand Turning Gear\***

Supplied with 5-inch diameter mounting flange for engines of 450 cubic inch maximum displacement, with 6-inch flange for all other sizes up to 800 cubic inch displacement. Both models furnished, arranged for either side or rear cranking. Weight of starter (including magneto) is but 17½ pounds.

# ECLIPSE Aircraft Engine Starters and Generators

The type 3 HB 6 Eclipse Aviation Hand Turning Gear is designed to crank the engine directly by hand power. It provides safe, dependable starting with a minimum of weight, and has proven its ability to deliver satisfactory performance on many commercial planes.

The starter consists of a reduction gear, operating an automatic meshing and demeshing mechanism through an adjustable torque overload release. This construction safeguards both the operator and the starter in case of backfire.

For easy starting, the Eclipse Aviation Hand Turning Gear is provided with a booster magneto geared to operate at high speed, thus furnishing a hot spark at low engine cranking speed.

**ECLIPSE AVIATION CORPORATION**  
EAST ORANGE, NEW JERSEY  
(Division of Bendix Aviation Corporation)